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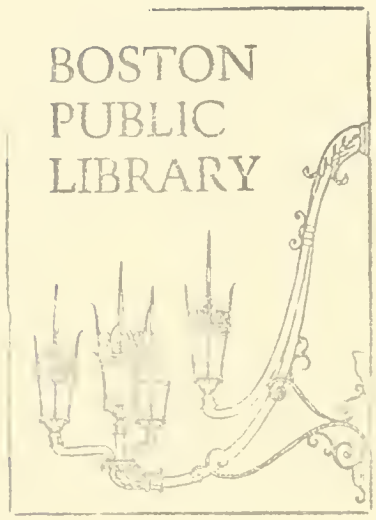
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PROJECT IMPACT REPORT
&
TRANSPORTATION ACCESS PLAN

PROPOSED PARKING STRUCTURE

600 Washington Street
Boston, Massachusetts

for

600 Washington Associates Limited Partnership
City of Boston

McDonough & Scully, Inc.

PROJECT IMPACT REPORT
AND
TRANSPORTATION ACCESS PLAN

PROPOSED PARKING FACILITY
600 WASHINGTON STREET
BOSTON, MASSACHUSETTS

JUNE, 1988

Prepared For
600 WASHINGTON ASSOCIATES LIMITED PARTNERSHIP

CITY OF BOSTON, MASSACHUSETTS
Boston Redevelopment Authority
Boston Transportation Department
Boston Air Pollution Control Commission

Prepared By
McDONOUGH & SCULLY, INC.
Suite 301, Two Kendall Street
Framingham, Massachusetts 01701

Tech Environmental, Inc.
Weidlinger Associates
Parkway Corporation

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I. APPLICANT INFORMATION

A. DEVELOPMENT TEAM

1. Names

•	Developer:	600 Washington Associates, L.P. 600 Washington Street Boston, Massachusetts 02111
	contact:	Judith A. Klein
	telephone:	423-0157
•	Attorney:	Rubin and Rudman 50 Rowes Wharf Boston, Massachusetts 02110
	contact	Charles Speleotis, Esq.
	telephone:	330-7044
•	Transp. Engineer	McDonough & Scully, Inc. Two Kendall Street, Suite 301 Framingham, Massachusetts 01701
	contact:	William J. Scully, P.E.
	telephone:	367-3020
•	Structural Engineer:	Weidlinger Associates 44 Brattle Street Cambridge, Massachusetts 02138
	contact:	Gaius Hershey
	telephone:	876-9666
•	Parking Consultant	Parkway Corp. 150 N. Broad Street Philadelphia, Pennsylvannia 19102
	contact:	Steve Shannon
	telephone:	215-569-8400
•	Environmental/Air Quality	Tech Environmental, Inc. Reservoir Place Waltham, Massachusetts
	contact:	Peter Guldberg
	telephone:	617-890-2220
•	Architect	Parkway Corp. 150 N. Broad Street Philadelphia, Pennsylvannia 19102
	contact:	Steve Shannon
	telephone:	215-569-8400

B. PROJECT SUMMARY

The 600 Washington Building, which is owned by the project Proponent, is an office building with its front door on Washington Street. Since the project Proponent has owned the building, they have completed several renovation projects, many of which were essentially maintenance and modernization projects (i.e. new electrical and mechanical systems). In addition, the elevators are being modernized. As leasing has taken place, interior office space has been renovated. A significant project contributing to the character of the building was the restoration of the 1st and 2nd floor facades. The result was to achieve the appearance of the building's original construction.

The proposed project is to renovate the remaining interior portion of the existing building for use as a commercial parking facility. The area of the building to be renovated is a badly deteriorated vacant theater which is located in the back section of the building. It is estimated that the parking facility will have a capacity of 300 to 350 parking spaces. No change in the current office or retail use is anticipated as a result of this project. The only effect on the building's facade will be in the vicinity of the garage access drives. Ventilation will consist of a closed exhaust system with outlet vents approximately 30 feet above the roadway surface.

The result of the project will be to enhance the operation of this existing building and provide parking in the 600 Washington Building area. By providing some parking for its users, some degree of competitiveness will be maintained. While the project is a parking project, it is not anticipated that all the parking facility's users will be associated with 600 Washington Street. One benefit of the project is to provide badly needed short term parking in the study area. A new supply of parking is not intended to increase traffic in the area, or increase the number of long term commuter parkers. The area has a high use of transit presently and it should be maintained. At the same time, however, there is a relatively high demand for short term parking during the day and an insufficient amount of

convenient short term parking supply in and around the study area. As a result, the motorists tend to circulate on the local roadways searching for parking spaces to no avail, adding to congestion.

This study was completed to determine the impacts associated with the proposed parking garage project at 600 Washington Street. As part of the examination, a transportation access plan has been developed and is intended to minimize the project's impact and achieve the project goals which include not encouraging an increase in peak hour traffic flow. Part of the study is an analysis of air quality impacts and historical considerations. A brief summary of the analyses and proposed mitigation plan is as follows:

Summary of Transportation Analysis

The following presents a summary of existing transportation conditions in the study area, and future conditions expected with the project.

Traffic Flow

Currently, traffic flow operations in the study area are at acceptable Levels of Service with the exception of Essex Street at Harrison Avenue/Chauncy Street which operates poorly during the PM peak hour due to Harrison Avenue (southbound) operating as a one lane approach.

It is estimated that the 600 Washington Garage will not generate significant peak hour traffic volumes to result in major increases in traffic flow levels. The analysis of this new traffic indicated that the Level of Service to any intersection in the study area will not change. In addition, vehicles will be able to enter and exit the garage safely and efficiently using Essex Street and Hayward Place.

Pedestrian Flow

The heaviest concentration of pedestrians in the study area currently occurs at the Washington Street /Essex Street/Boylston Street intersection. The presence

of the Essex Street MBTA "T" Station is a major contributing factor to the pedestrian concentration. The predominant pedestrian flow is generally along Washington Street as opposed to Harrison Avenue. The east side of Washington Street and the south side of Essex Street were observed to have heaviest flows. The observed patterns are not expected to change significantly as a result of the project, although there will be additional pedestrians walking from the garage towards Washington Street. While no problems are expected, considerations are included in the mitigation plan.

Transit Service

The 600 Washington Street site is well served by the public transportation. Past surveys have shown a very high use of transit by employees of the building. The Orange Line Essex Street station is located adjacent to the building. Green Line and Red Line stations are located within a convenient walking distance of the site. Bus service is provided to the area by three bus routes that travel through or close to the study area. The proposed garage plan is not expected to have an appreciable effect on transit service in the site area as the parking management program will be structured to discourage diversion from transit to automobile trips.

Parking

On-street parking is severely limited in the study area. Only nineteen percent of the study area's available curb space is designated for short term or public parking (metered and unrestricted), while sixteen percent is allocated for special uses such as loading zones, government vehicles, and handicapped parking.

Peak period observations of on-street parking indicate a relatively severe shortage of space in the study area for parking and loading/delivery activities. Peak parking demand was observed to be approximately 160% of the area's available supply. Numerous vehicles on minor streets were double parked during the observation periods. While there are 8,367 public, off-street parking

spaces within 1500 feet of the Washington Street site, the majority of the public parking supply (60%) exists beyond 1000 feet of project.

The parking management plan for the proposed 600 Washington Street Garage is primarily planned to accommodate the short term parker. The number of commuter/long term parkers in the structure will be limited. In addition, the parking rates will be structured to discourage long term parking in the facility.

Air Quality

The effect on ambient air quality due to the construction of the parking garage at 600 Washington Street was studied in two areas--motor vehicle traffic at nearby roadway intersections, and emissions from the proposed parking garage. The analysis predicted 8-hour carbon monoxide (CO) concentrations at four sensitive receptors for two scenarios--1989 No-Build and 1989 Build.

Carbon monoxide levels from vehicular traffic were added to the exhaust vent concentrations at all receptors for the 1989 Build case and compared to the 1- and 8-hour National Ambient Air Quality Standards. The highest CO concentrations for the 1989 No-Build case then will be 11.6 ppm for the peak 1-hour and 7.7 ppm for the peak 8-hour period. The maximum 1- and 8-hour levels for each scenario are safely in compliance with the NAAQS. As a result, it is concluded that the operation of the proposed parking garage will not adversely affect air quality at any of the sensitive receptors.

C. LEGAL INFORMATION

The subject building of this project is the only one which the project Proponent owns in the City of Boston. There are no known legal judgements pending on this property. In addition, the property has not been in tax arrears while under the ownership of the project proponent.

II. FINANCIAL INFORMATION

This section of the report includes the identification of those financially involved in the project. Also presented is the most recent Pro Forma on the project which provides information as to the project's economic feasibility.

A. FINANCIAL DISCLOSURES

Exhibit B on the following page identifies the various individuals who make up the partnership which owns 600 Washington Street. The two banks which work with the building owners are as follows:

Neworld Bank	American Savings Bank
55 Summer Street	Avenue of the Americas
Boston, MA	New York, NY

B. AGREEMENTS

The project as currently planned consists of constructing a parking facility within the existing building structure at 600 Washington Street. The property is currently owned by the proponent and there is no need to acquire any additional land to complete the project. As a result, there are no agreements pending related to the purchase of additional property in order to construct this project.

C. PRO-FORMA

Exhibit C on the following page presents the most recent pro forma for review. It has been developed assuming a project cost of $5.5 million with a 20 year debt service. The annual debt service for the project is estimated to be $657,000. Annual operating costs in the first year are estimated to be $1,358,000 including debt service and are assumed to increase at an annual rate of 5%. The table

EXHIBIT "A"

Robert M. Bass
6221 Westover Drive
Fort Worth, TX 76107

David G. Marshall
275 Meeting House Road
New Hope, PA 18938

Denise Marshall
275 Meeting House Road
New Hope, PA 18938

Stephen Marshall
275 Meeting House Road
New Hope, PA 18938

Kenneth P. Balin
2015 Spruve Street
Philadelphia, PA 19103

Dort Cameron
Airlie Farm
Bedford, NY 10506

Elizabeth C. Cameron
Airlie Farm
Bedford, NY 10506

Seth Cameron Trust
Airlie Farm
Bedford, NY 10506

Sarah Cameron Trust
Airlie Farm
Bedford, NY 10506

Miles Cameron Trust
Airlie Farm
Bedford, NY 10506

Eliza Cameron Trust
Airlie Farm
Bedford, NY 10506

Arthur F. Hirsch
21 Haymarket Lane
Bryn Mawr, PA 19010

Bruce H. Golboro
405 Meadow Lane
Merion, PA 19066

Thomas R. DiBenedetto
78 Maolis Road
Nahant, MA 61908

C. Ronald Bleznak
8226 Fairview Road
Elkins Park, PA 19117

David Bonderman
31 First City Bank Tower
201 Main Street
Fort Worth, TX 76102

Peter T. Joseph
3100 First City Bank Tower
201 Main Street
Fort Worth, TX 76102

J. Taylor Crandall
3100 First City Bank Tower
201 Main Street
Fort Worth, TX 76102

William L. Rogers
3100 First City Bank Tower
201 Main Street
Fort Worth, TX 76102

David M. Schwarz
511 11th Street, N.W.
Washington, DC 20004

PRO FORMA OF INCOME AND EXPENSE
600 WASHINGTON STREET PARKING GARAGE
BOSTON, MA

ITEM		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20	TOTAL
INCOME (in thousands):																						
Number of cars:	350																					
Annual $ per car:	$3,600	$1,260	$1,323	$1,389	$1,459	$1,532	$1,608	$1,689	$1,773	$1,862	$1,955	$2,052	$2,155	$2,263	$2,376	$2,495	$2,619	$2,750	$2,888	$3,032	$3,184	**$41,663**
(5% annual increase)																						
EXPENSES (in thousands):																						
Debt Service:																						
Principal Amount:	$5.5 Million																					
Term in years:	20 years																					
Rate:	10.25%																					
Annual Payment:		($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	($657)	
Operating:																						
rent		($300)	($315)	($331)	($347)	($365)	($383)	($402)	($422)	($443)	($465)	($489)	($513)	($539)	($566)	($594)	($624)	($655)	($688)	($722)	($758)	
bookkeeping		($6)	($6)	($7)	($7)	($7)	($8)	($8)	($8)	($9)	($9)	($10)	($10)	($11)	($11)	($12)	($12)	($13)	($14)	($14)	($15)	
insurance		($25)	($26)	($28)	($29)	($30)	($32)	($34)	($35)	($37)	($39)	($41)	($43)	($45)	($47)	($49)	($52)	($55)	($57)	($60)	($63)	
labor		($235)	($247)	($259)	($272)	($286)	($300)	($315)	($331)	($347)	($365)	($383)	($402)	($422)	($443)	($465)	($489)	($513)	($539)	($566)	($594)	
utilities		($20)	($21)	($22)	($23)	($24)	($26)	($27)	($28)	($30)	($31)	($33)	($34)	($36)	($38)	($40)	($42)	($44)	($46)	($48)	($51)	
maintenance		($5)	($5)	($6)	($6)	($6)	($6)	($7)	($7)	($7)	($8)	($8)	($9)	($9)	($9)	($10)	($10)	($11)	($11)	($12)	($13)	
management fee		($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	($100)	
miscellaneous		($10)	($11)	($11)	($12)	($12)	($13)	($13)	($14)	($15)	($16)	($16)	($17)	($18)	($19)	($20)	($21)	($22)	($23)	($24)	($25)	
Total Expenses		($1,358)	($1,388)	($1,420)	($1,453)	($1,488)	($1,524)	($1,562)	($1,603)	($1,645)	($1,689)	($1,736)	($1,785)	($1,836)	($1,890)	($1,947)	($2,007)	($2,069)	($2,135)	($2,203)	($2,276)	**($35,014)**
Net Income before taxes and depreciation:		($98)	($65)	($31)	$6	$44	$84	$126	$170	$217	$265	$316	$370	$426	$486	$548	$613	$681	$753	$829	$908	**$6,649**

illustrates that for the first three years, the project will actually lose money, totalling $194,000. From year four on, the project is expected to generate a positive cash flow.

III. PROJECT AREA

The legal description of the project area follows, as Exhibit C.

EXHIBIT C

A certain parcel of land with the buildings thereon situate and now numbers 588-622 inclusive on Washington Street in Boston, Suffolk County, Massachusetts being bounded and described as follows:

NORTHWESTERLY	by Washington Street;
NORTHEASTERLY	by Hayward Place;
SOUTHEASTERLY	by Harrison Avenue; and
SOUTHWESTERLY	by Essex Street

A portion of said premises is registered land being the premises described in Certificate of Title No. 79352 in the Suffolk Registry District. Said portion being in said Certificate of Title bounded and described as follows:

Beginning on the Southerly side of Hayward Place at the junction between the iron column and a brick wall distant twenty-one and 93/100 (21.93) feet Westerly from the intersection of the Southerly side line of Hayward Place with the Westerly side line of Harrison Avenue, thence the line runs in a Southerly direction bounding Easterly on land formerly of Emma M. Stokes along and through a brick partition wall fifty-seven and 26/100 (57.26) feet to a point in the brick partition wall eight inches Southerly from the Northerly face thereof;

Thence turning and running in a Westerly direction through said party wall and bounding Southerly on land formerly of John Stetson, Sr. twenty-one and 39/100 (21.39) feet to the center of the brick partition wall;

Thence turning and running Northerly and bounding Westerly on land formerly of Freeman Wight through the center of the brick partition wall fifty-seven and 15/100 (57.15) feet to the Southerly side line of said Hayward Place at the junction of two iron columns;

Thence Easterly along said Southerly side line of Hayward Place twenty-one and 94/100 (21.94) feet to the point of beginning.

Said land is shown on a plan drawn by H.S. Adams, C.E. dated Jan. 21, 1901, filed in the Land Registration Office, a copy of a portion of which is filed with certificate of Title No. 218, together with the appurtenant drainage rights as set forth in Indenture referred to in item 2 below.

1. Title to and rights of the public and others entitled thereto in and to those portions of the premises lying within the bounds of Washington Street, Hayward Place, Harrison Avenue and Essex Street.

2. Drainage rights set forth in Indenture between Francis Standish and William Gridley dated June 2, 1845 and recorded with the Suffolk County Registry of Deeds in Book 549, Page 130.

3. Rights and easements granted by Ralph G. Carpenter and J. H. Magee, Trustees of Washington - Essex Real Estate Trust to Boston Edison Company dated May 11, 1961, recorded with said Deeds in Book 7565, Page 387.

4. Rights of the Massachusetts Bay Transportation Authority as successor to Boston Transit Commission under the premises as set forth in an Agreement recorded with said Deeds in Book 3008, Page 465.

For reference to title see deed from Walter D. Wekstein, Trustee of 600 Washington Realty Trust, to 600 Washington Associates Limited Partnership dated April 26, 1984, recorded with said Deeds and filed for registration with said Registry District of even date herewith.

V. A. TRANSPORTATION ACCESS PLAN

A. INTRODUCTION

This transportation study sets forth findings and conclusions pertaining to the transportation implications of the proposed project, and documents the transportation access plan for the proposed 600 Washington Garage A Transportation Access Plan as defined in the Downtown Zoning by the City of Boston contains four elements as follows:

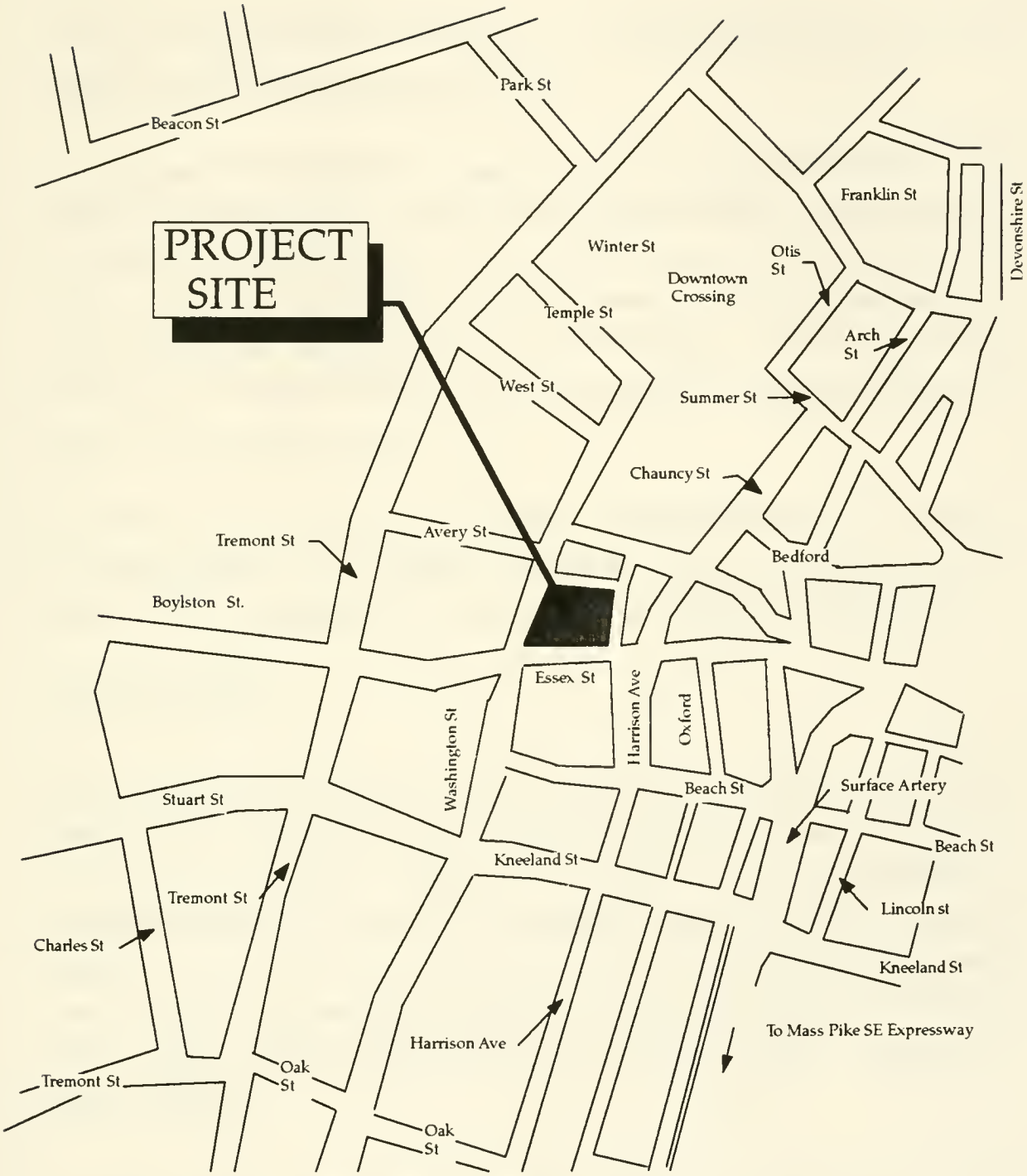
- Traffic Management
- Parking Management
- Construction Management
- Monitoring Plan

In developing the Access Plan, a comprehensive traffic analysis was completed. It includes a thorough description of the existing transportation characteristics related to the above areas of focus and the expected conditions in the 1990 planning design year.

The project is located in "Midtown" near Downtown Crossing and bounded by Washington Street, Essex Street, Hayward Place, and Harrison Avenue. Figure 1 presents the site location in relation to the downtown street system.

1. The Proposed 600 Washington Street Parking Garage Project

The project will be constructed in the Washington-Essex Building with an address of 600 Washington Street. This existing structure is a multi-story office building, with abandoned theaters in the lower rear portion of the building. Most recent information indicates that the building is fully occupied with approximately 1200 employees working in the building. There are several private and public offices on the site. One of the largest public tenants is the Massachusetts Department of Public Welfare. Other frequently visited offices are



Project Location

600 Washington Street Garage
Boston, Massachusetts

NORTH

NOT TO SCALE

FIGURE 1

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

the U.S. Justice Department, Immigration and Naturalization Services and the Massachusetts Division of Industrial Accidents

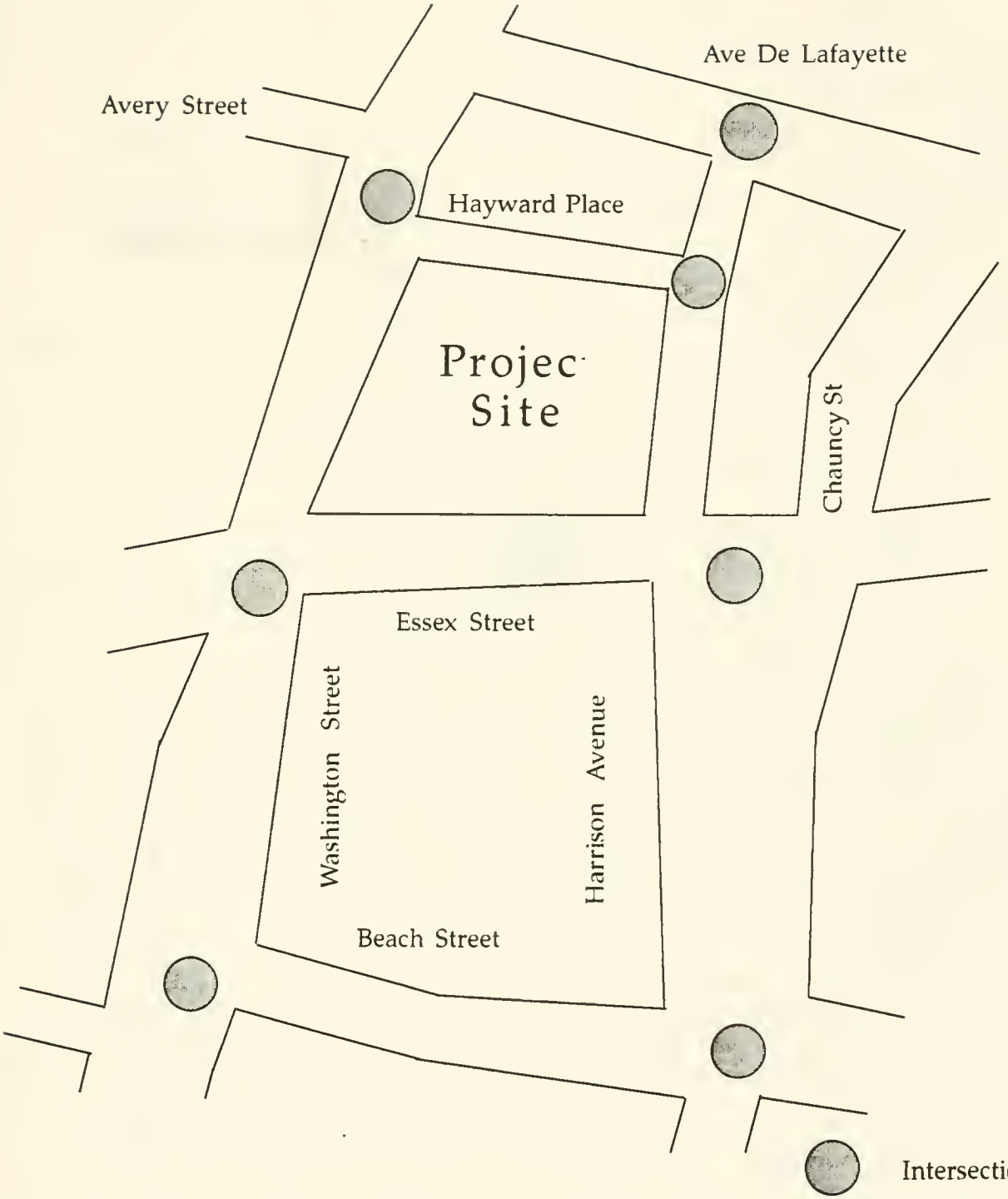
The proposed 600 Washington Garage will provide approximately 300 to 350 parking spaces that will be constructed in the rear of the parcel in the area which is presently occupied by an unused theater. The subsequent analysis assumes 350 spaces. The proposed garage will have six levels. At the present time, it is anticipated that the facility will operate with attendants to maneuver vehicles allowing for maximum efficiency. Access and egress to this facility is planned for Hayward Place and Essex Street.

The construction of a parking garage at 600 Washington Street will occur within the existing structure and will need to be carefully planned. The project involves removal of the existing mezzanine levels, while maintaining the auditorium level.

2. The Study Area

This Transportation Access Plan involves study of the site location and several adjacent blocks. The study area for the traffic management element include the key intersections presented on Figure 2. The study area is generally bounded by Avenue De Lafayette on the north; Washington Street on the east; Chauncy Street/Harrison Avenue on the west and Beach Street on the south. The study area for the parking management element includes all major public parking facilities within approximately 1500 feet of the project location. This area is shown in Figure 3.

The analysis area also falls within the designated Midtown/Cultural District. The Midtown/Cultural District is one of 11 districts in downtown Boston that were identified to be studied for permanent zoning over a two year planning horizon. The major focus of the revised downtown zoning is to develop a plan to manage growth. The district studies will examine a wide array of design and development issues that will allow for development of strategies in areas such as:



Study Area

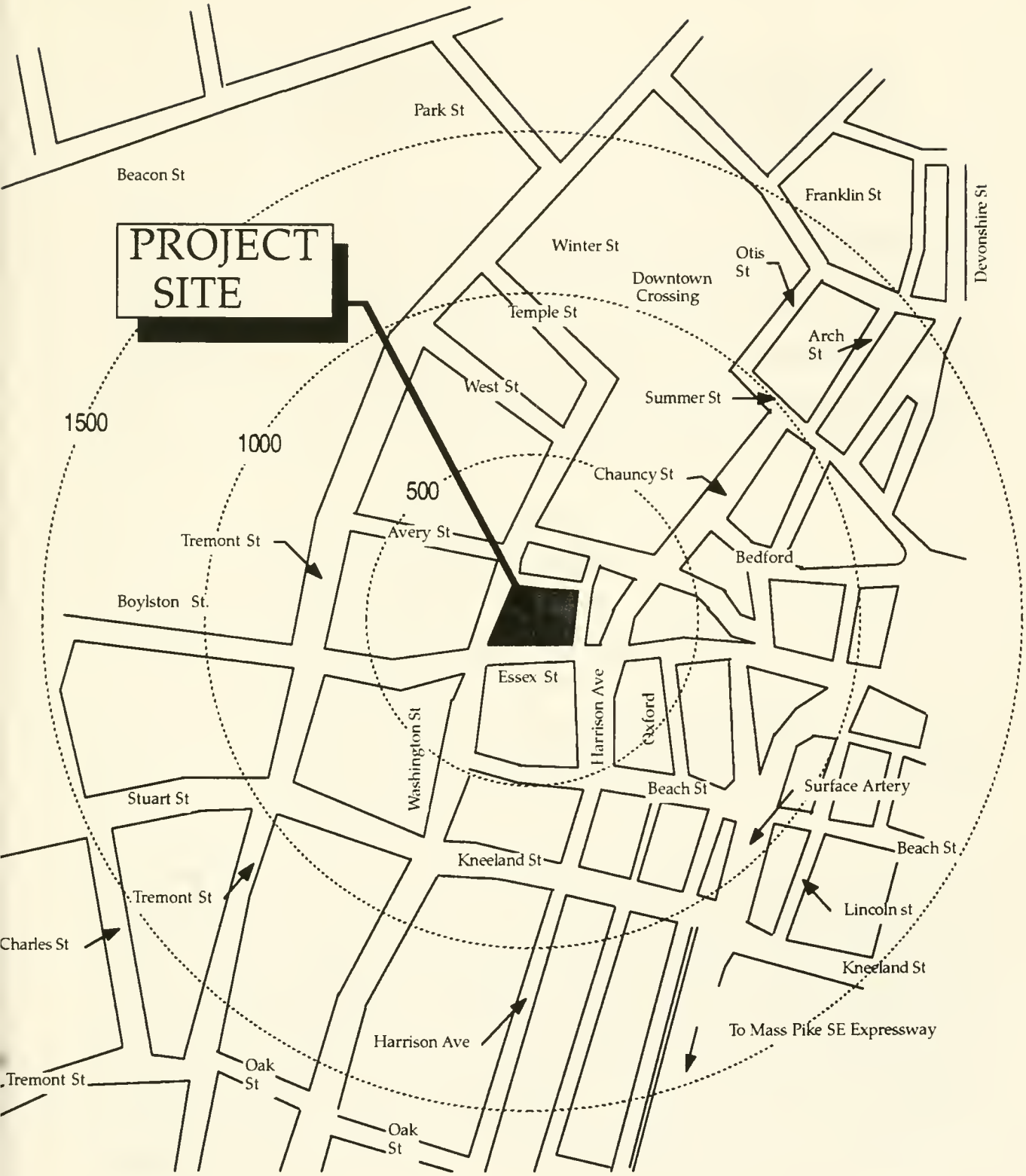
600 Washington Street Garage
Boston, Massachusetts

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

NORTH

NOT TO SCALE

FIGURE 2



Parking Study Area

600 Washington Street Garage
Boston, Massachusetts

NORTH

NOT TO SCALE

FIGURE 3

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

- District design guidelines
- Historic preservation
- Revised zoning
- Housing affordability
- Traffic management
- Open space

According to the BRA, the Midtown/Cultural District has several underutilized or vacant parcels that can provide additional office space for some of the expanding firms. A recent BRA survey reported that this District was considered to be a desirable location, especially for the expanding Back Bay firms. The adjacent Chinatown neighborhood will have significant influence in planning for the district as well. The objectives of the planning process include:

- Provide housing opportunities,
- Create new spaces for cultural use,
- Restore the landmark buildings,
- Improve and encourage pedestrian traffic,
- Incorporate mix of land uses,
- Strengthen the image and identity of district, and
- Develop a transportation system that serves the area while being sensitive to the neighboring area needs.

Of particular importance to the proposed 600 Washington Garage is its relationship to the transportation and pedestrian access components of the district. The importance of transportation to the success of the cultural center is well documented by the BRA. The BRA has indicated that a planning goal of the process is to establish support for encouraging the use of the cultural center during the day and nighttime activity periods.[1] The 600 Washington Garage is strategically located to allow for convenient parking to all theater locations. In addition, development of the access plan and parking management programs presented herein insures that the project be sensitive to the needs of the adjacent neighborhoods while being compatible with cultural district goals.

[1]Boston Redevelopment Authority, Midtown Cultural District Plan, Framework For Discussion, Boston, Massachusetts, 1987.

3. Study Scope

The Transportation Access Plan was developed in three phases. The first phase included a comprehensive inventory and analysis of the existing transportation conditions. This was accomplished by reviewing past traffic studies, collecting additional data and analyzing the results. The result of Phase 1 was a complete perspective of the existing transportation system in the proximity of the project.

Phase 2 used the results of the first phase to determine the potential transportation impacts by the 600 Washington Garage. Using the planning horizon of 1990, various transportation systems were estimated. Included in the demand forecasts were future developments by others as well as any planned roadway and parking improvements. Following the forecasting process, the transportation system was reanalyzed to determine the location and magnitude of deficiencies. These identified deficiencies were used as the basis of developing the mitigation measures.

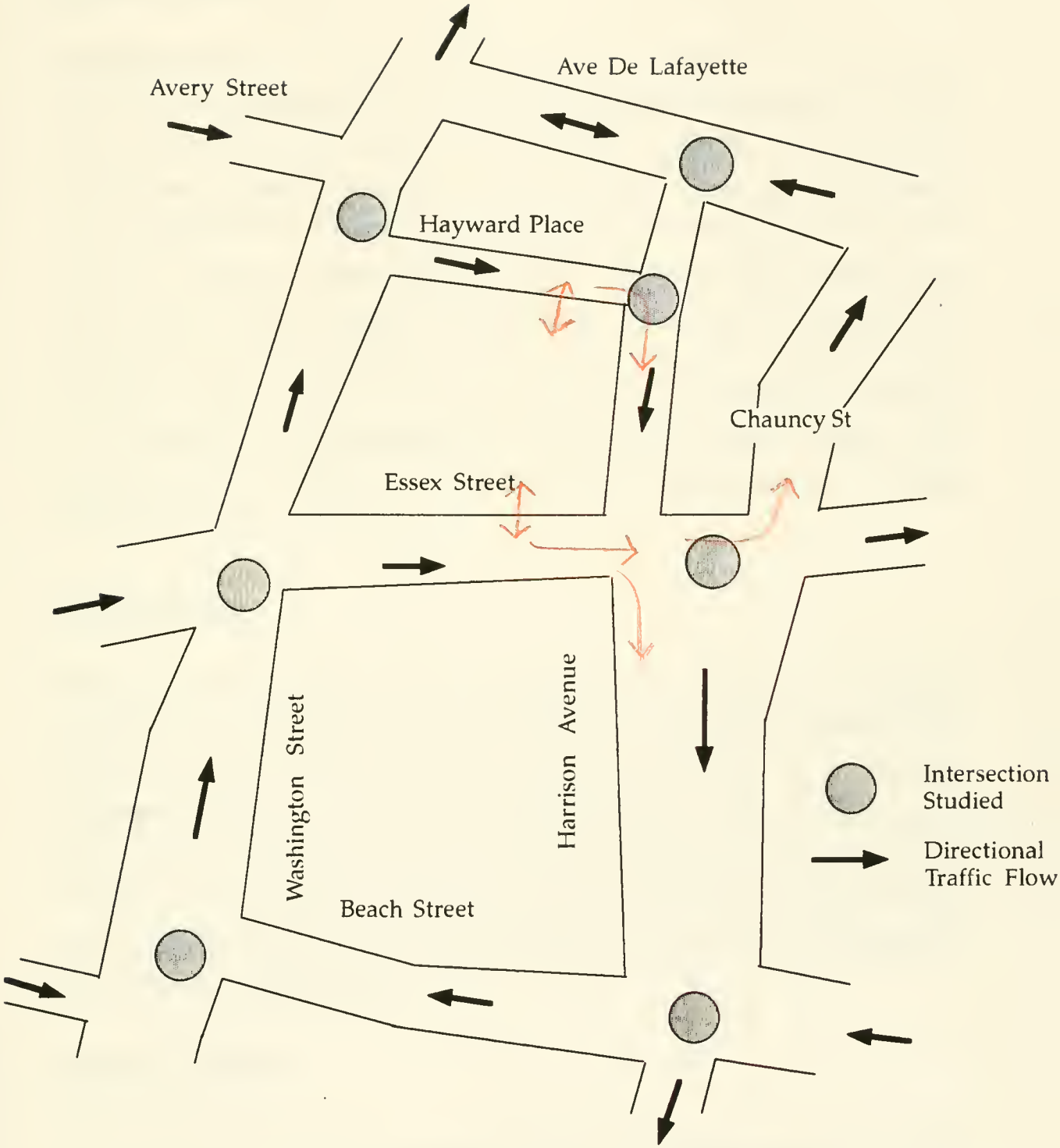
The last phase of the study describes measures to mitigate any adverse impacts on the transportation system. The recommended elements of the access plan are also included under this phase of the study.

B. EXISTING TRANSPORTATION CONDITIONS

This section of the Transportation Access Plan is primarily concerned with the existing conditions of the transportation system. Included in this section is a description of the inventory of the roadway network, parking system, and public transportation. Analysis of existing operating conditions is also included within this section.

1. Roadway Network

Figure 4 illustrates the network in the study area. It also shows the current street pattern which is made up of a series of one-way streets.



Existing Traffic Circulation

600 Washington Street Garage
Boston, Massachusetts

NORTH

NOT TO SCALE

FIGURE 4

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

Washington Street

Washington Street is a two lane arterial that restricts traffic in the study area to one-way northbound traffic flow. This facility, in addition to serving as a major facility in the study area, traverses the City through West Roxbury connecting into Dedham, where it is designated as Route 1A. Two blocks north of the study area, Washington Street becomes part of Downtown Crossing which is an auto free zone. South of the site, Washington Street connects with Kneeland Street which provides access to both the Massachusetts Turnpike and the expressways. Washington Street is expected to serve as a major access roadway for 600 Washington Street. On the southwestern corner of the 600 Washington Building is the intersection of Washington Street with Boylston and Essex Streets. This key intersection, in addition to serving vehicular traffic has significant crossing pedestrian flows.

Harrison Avenue

Harrison Avenue, through the study area parallels Washington Street and restricts traffic to a one-way southbound flow. This major facility connects into Blue Hill Avenue via Warren Avenue in Roxbury. The northern terminus of Harrison Avenue is at Avenue De Lafayette, one block north of the site. At Phillips Square, Harrison Avenue intersects with Chauncy and Essex Streets. Currently, this intersection is being studied by the Boston Redevelopment Authority (BRA) for potential improvements which may include geometric modifications and signalization.

Avenue De Lafayette

This relatively new four lane roadway, which was constructed as part of the Lafayette Place development, connects Essex Street east of the project to Washington Street, north of the site. Under current conditions, it primarily serves as a major access way to the Lafayette Place parking garage which has

over 1200 parking spaces and is located two blocks north of the 600 Washington Building. The garage serves Lafayette Place, a mixed-use development consisting of retail and hotel use.

Essex Street

This east-west facility directly abuts the site on the southern boundary and will provide access to the proposed parking garage. Essex Street is a two lane road connecting Boylston Street at Washington Street to Atlantic Avenue, just south of South Station. Between Washington Street and the Surface Artery, Essex Street forms the northern boundary of Chinatown. The Boston Transportation Department (BTD) has conducted a preliminary traffic planning study for the Essex Street corridor focusing on upgrading and improving its function along with Avenue De Lafayette. At the same time, however, the BRA is conducting traffic studies of the cultural district and the Chinatown area and these may also affect the current street circulation pattern in the area.

Hayward Place

This one block local street connects Harrison Avenue to Washington Street on the northern project boundary. This facility is a local roadway that restricts traffic flow one way eastbound. Field observations indicated that this street is used as a loading area to serve the current tenants of the 600 Washington Building. This facility will serve as one of the access streets to the proposed parking garage. The BTD of the Essex Street corridor has explored the possibility of relocating the road slightly to the north to better align with Avery Street. This concept has not been finalized and will depend in part on the final plans of the Lafayette Place II development, one block to the north.

Beach Street

This local street is two blocks south of the site. It is oriented in an east-west direction and restricts traffic to a one way westbound flow. The intersections of Beach Street at Washington Street and at Harrison Street will be studied as part

of this project. It provides access from the Surface Artery and Central Artery into the study area.

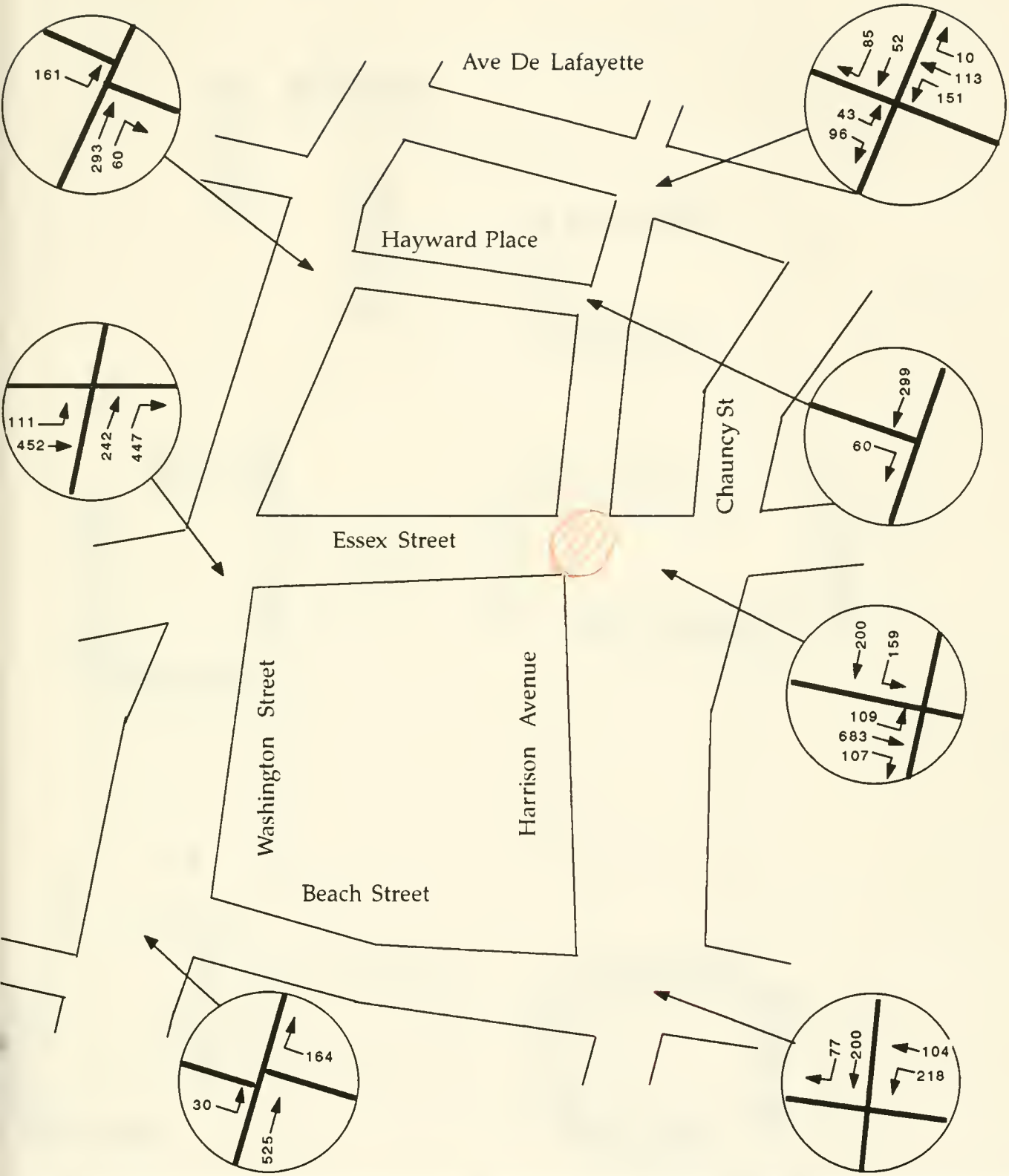
2. Traffic Volumes

A key element in evaluating the performance of the roadway system is understanding the daily and peak commuter period traffic flows. The study process included a thorough review of traffic count data collected in the study area by others, including the City of Boston. Those locations where recent, useable data did not exist, new counts were conducted as part of the overall data collection program in this study. All of the data were then compiled to form the peak hour traffic flow networks as presented on Figures 5 and 6 for the AM and PM peak hours, respectively. The network was balanced to reflect consistent flows within the study area.

As shown on the Figures, traffic flow demands do not vary between the AM and PM peak hours. Essex Street carries the most traffic during both the morning and evening peak hours. Washington Street serves heavy traffic flows, however, the traffic tends to be lower as Washington Street approaches Downtown Crossing as would be expected. Avenue De Lafayette, Beach Street and Hayward Place carry relatively low volumes of traffic particularly when compared to the other streets in the study area.

3. Pedestrian Flows

Pedestrian crossing counts were also conducted during the data collection phase of this study. The crossing counts are summarized on Figures 7 and 8 for the AM and PM peak hours, respectively. As illustrated, the Washington/Essex Street intersection had the greatest number of pedestrian crossings during both peak hours. During the AM peak, the Harrison Avenue/Essex Street/Chauncy Street intersection was second followed by Beach Street at Harrison Avenue. The reverse was true for the PM peak hour as Beach Street at Harrison Avenue was



1988 PM Peak Traffic Volumes

600 Washington Street Garage
Boston, Massachusetts

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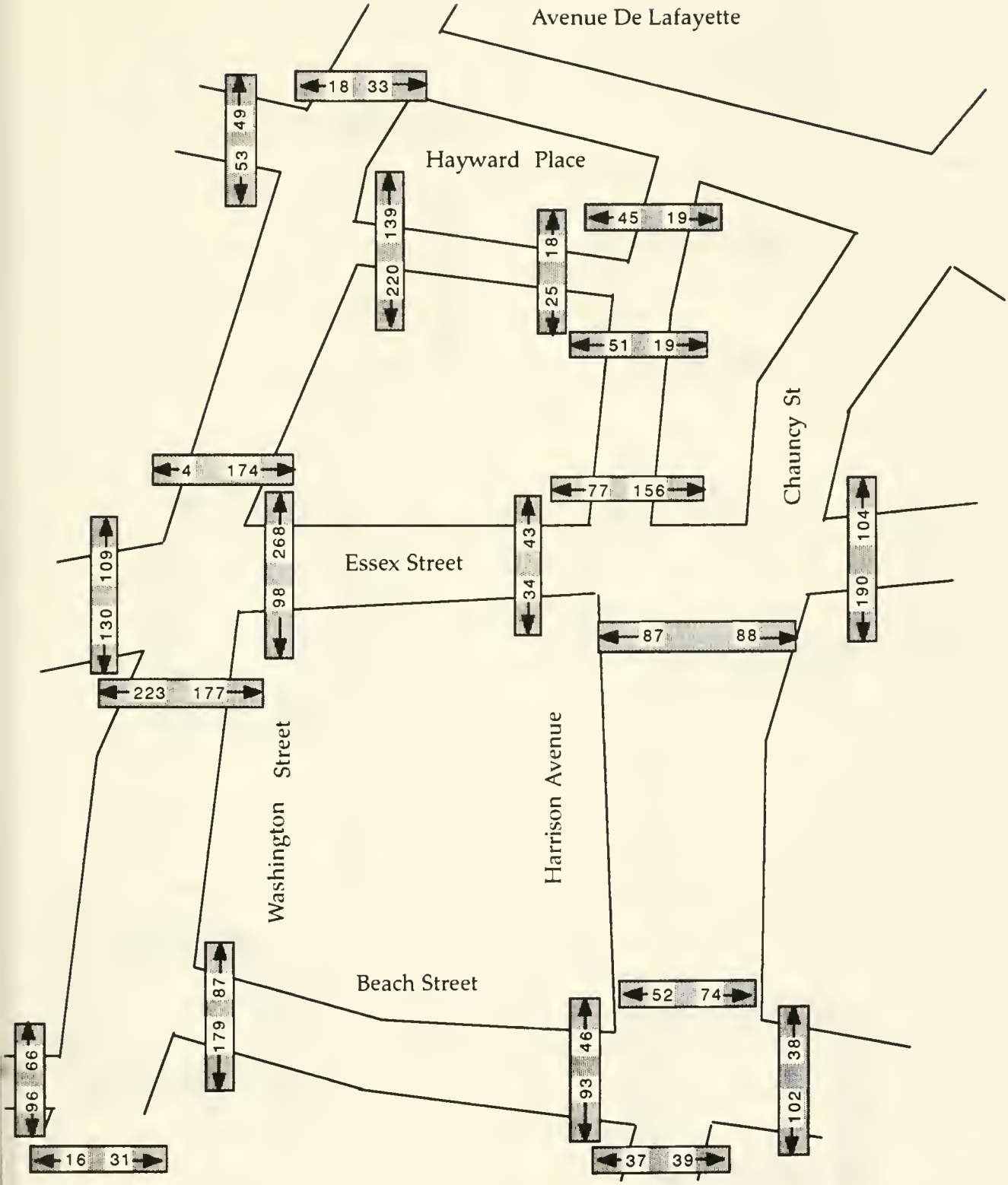
NORTH

NOT TO SCALE

FIGURE 6



1988 AM Pedestrian Flows

600 Washington Street Garage
Boston, Massachusetts

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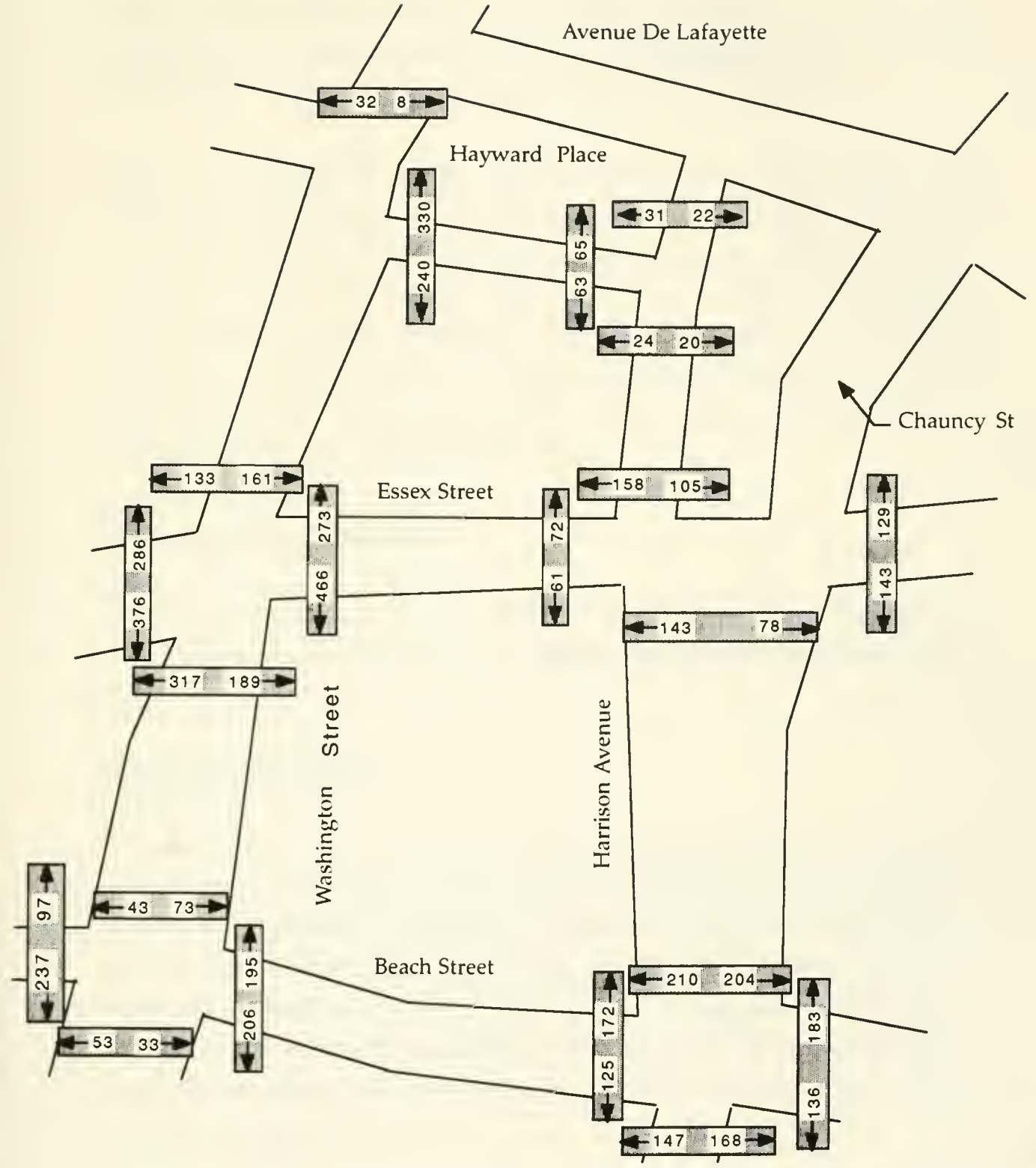
FIGURE 7



1988 PM Pedestrian Flows

600 Washington Street Garage
Boston, Massachusetts

NORTH

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FIGURE 8

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second followed by Essex Street at Harrison Avenue/Chauncy Street. The single highest pedestrian volume was observed crossing Essex Street, east of Washington Street, with 739 pedestrians crossing in both directions.

Based on the pedestrian crossing counts the south side of Essex Street near Washington Street appears to have the highest pedestrian volumes during both the AM and PM peak hours. Washington Street carries more pedestrians than Harrison Avenue. The predominant pedestrian flow on Beach Street occurs on the north side of the street. Based on a review of the pedestrian counts and field observations, the major north-south pedestrian flows in the study area occur on Washington Street. The east-west pedestrian flows occur primarily on Essex Street during both the AM and PM peak hours.

4 Existing Traffic Operations

The following section presents an analysis of traffic operations during the AM and PM peak hour conditions under the existing volumes and current circulation system.

Measures of Performance

"Level of Service" is an indicator of the operating conditions which occur on a given roadway when accommodating various traffic volumes. It is a qualitative measure which accounts for a number of operational factors including roadway geometry, speed, travel delay, freedom to maneuver and safety. When the criteria are assessed and a Level of Service ("LOS") is assigned to a roadway or intersection, it is equivalent to presenting an "index" to the operational qualities of the section under study. Level of Service is defined in the Highway Capacity Manual by six levels, "A" to "F".

In practice, any given roadway may operate at a wide Level of Service range depending upon time of day, day of week or period of year. Level of Service "C", a condition of stable flow, is considered desirable for peak or design flow

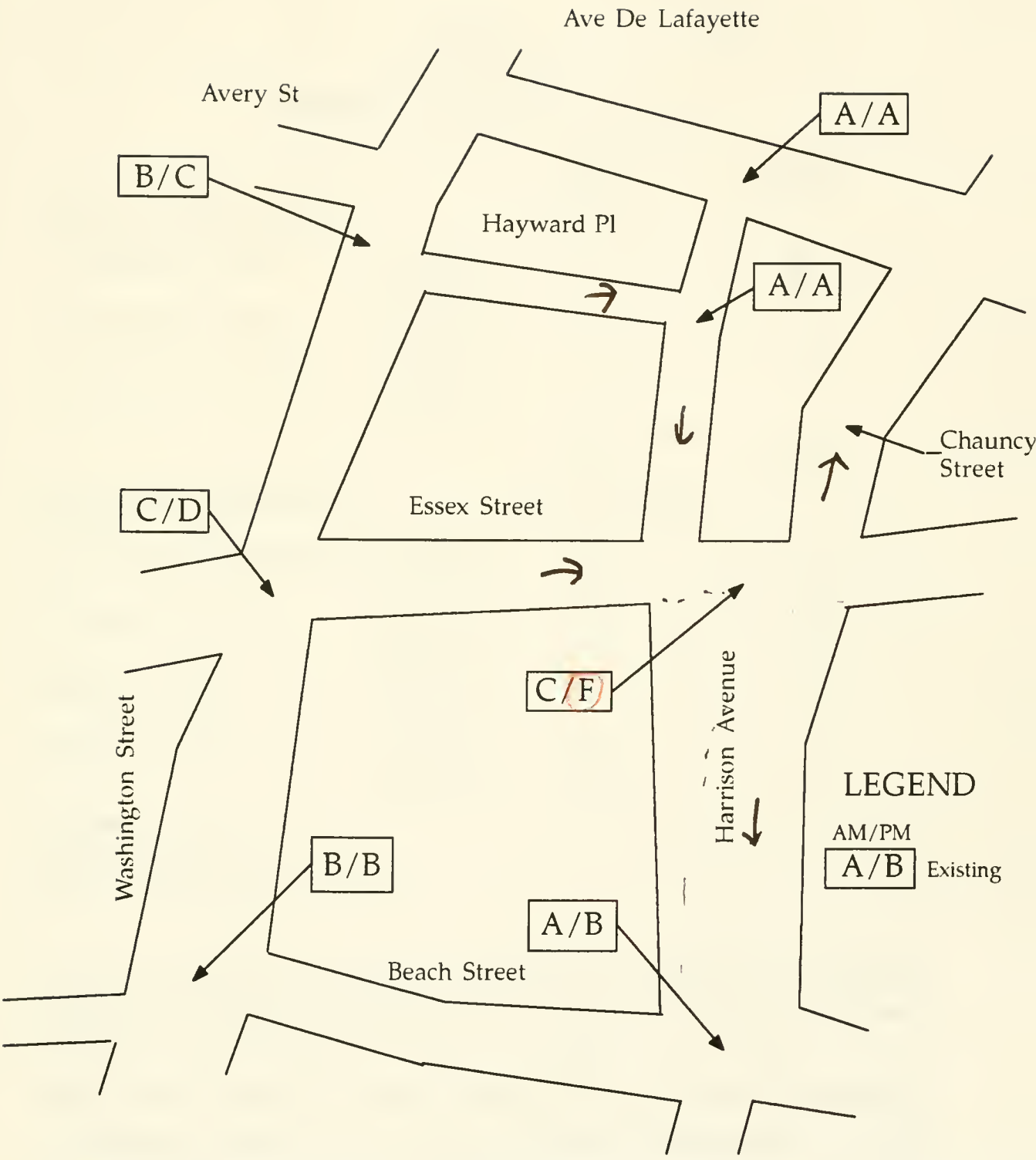
in rural areas. LOS "D" (more significant delays than "C") is considered acceptable in urban areas. LOS "A" is the optimum condition of free flow. Level of Service "E" represents unstable flow conditions, but indicates near or at maximum utilization of a roadway facility under less than ideal conditions. LOS "F" generally indicates a condition in which external factors (i.e. breakdown) result in forced flow illustrated by long delays and vehicle queues. LOS "E" operations in major cities like Boston are increasingly tolerated for peak periods as physical and environmental constraints tend to prevent major local street improvements.

In urban locations such as the study area in Boston, the critical locations for capacity considerations are the intersections. The intersections nearest to the traffic generator are typically the key locations since, with regional highway access close to 600 Washington Street, the site traffic is expected to disperse relatively quickly onto the regional expressways. Using the physical street inventory and the traffic flow networks, the Level of Service has been determined at the key study area intersections. The methodologies used follow procedures outlined in the 1985 Highway Capacity Manual,[2] distributed by the Transportation Research Board.

Analysis

The three intersections on Washington Street: LeGrange/Beach Streets, Essex/Boylston Streets and Hayward/Avery Place were evaluated under the traffic signal analysis techniques while the intersections on Harrison Avenue were all evaluated with the unsignalized analysis method. Figure 9 and Table 1 present a summary of the current traffic operations for both the AM and PM peak hours.

[2]Transportation Research Board, Special Report 209, Highway Capacity Manual, Washington, D.C., 1985.



Traffic Analysis 1988 Existing

600 Washington Street Garage
Boston, Massachusetts

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FIGURE 9

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TABLE 1

SUMMARY OF

EXISTING TRAFFIC OPERATIONS

		Delay (seconds)	LOS
1. Signalized Intersections:			
Washington/Beach	AM Peak	11.1	B
	PM Peak	12.0	B
Washington/Essex	AM Peak	21.9	C
	PM Peak	33.4	D
Washington/Hayward	AM Peak	5.8	B
	PM Peak	23.5	C
		ARC (Vehicles/hour)	**LOS**
2. Unsignalized Intersections:			
Ave De Lafayette/Harrison	AM Peak	904	A
	PM Peak	674	A
Harrison/Hayward	AM Peak	970	A
	PM Peak	570	A
Harrison/Essex	AM Peak	201	C
	PM Peak	0	F
Harrison/Beach	AM Peak	431	A
	PM Peak	306	B

LOS - level of service
ARC - available reserve capacity

As shown above, traffic operations in the study area under existing conditions are generally acceptable with the exception of Essex Street at Chauncy Street and Harrison Avenue. Calculations indicate that the traffic approaching Essex Street from the north on Harrison Avenue Extension experiences relatively long delays in attempting to maneuver into or crossing the Essex Street traffic stream. Based on field observations, it appears that the illegal parking on the east side of Harrison Avenue between Hayward Place and Essex Street contribute to this problem by limiting travel to only one lane of traffic moving on Harrison

Avenue.

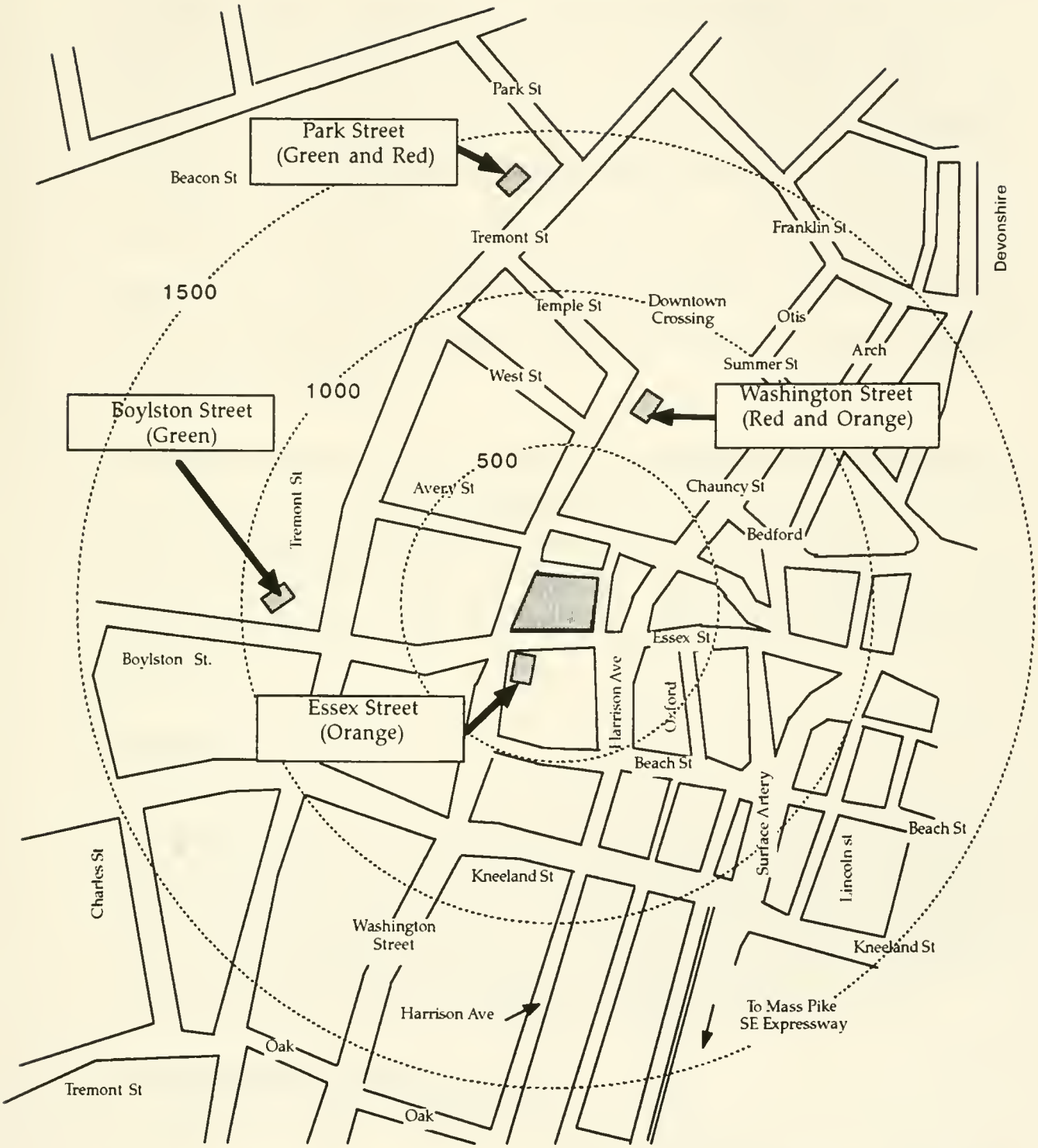
5. Public Transportation System

600 Washington Street is in close proximity to public transportation facilities. This is important as well as advantageous as it will tend to discourage shifts from transit to the private automobile simply as a result of the proposed project. The following discussion presents an overview of public transportation service in the study area.

Rapid Transit

Three of the four rapid transit lines in Boston conveniently serve buildings in the study area. Figure 10 indicates the station locations with respect to the project site. The Orange Line is closest with Essex Station located opposite from the site on both Washington and Essex Streets. The Orange Line recently opened the new southwest corridor alignment. The Green Line's Boylston Street station is located two blocks west of the site on the southeast corner of the Boston Common and Park Street Station (Green and Red Line) is northwest of the site. The Red and Orange lines intersect at Washington Street station which is located approximately three blocks north of 600 Washington Street. The Washington Street station is currently undergoing reconstruction by the MBTA. The Washington Street Station will be modernized and the platform for the Orange Line will be lengthened to accommodate six car trains. Convenient transfers to the Red Line are available to Blue Line Passengers at the State Street station, one stop away from Washington Street.

The Essex Street Station on the Orange Line is the most convenient to the 600 Washington Street Building and the study area. With the recent improvements to the Orange Line, the platforms for this station had to be reconstructed to accommodate the longer trains. Presently, both the northbound and southbound platforms are capable of serving six car trains. The southbound line



Mass Transit Facilities

600 Washington Street Garage
Boston, Massachusetts

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FIGURE 10

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is complete for the present time, however, as the west side of Washington Street is developed there is a potential for additional improvements. With the recent platform extension, primary pedestrian access for the northbound Orange Line occurs at the Liberty Tree Building, which is one block south of the site. This improvement program also required full accessibility to the handicapped population. Due to constraints within the Liberty Building an elevator could not be constructed at that location. The MBTA asked for and was granted a two year extension to begin construction of a fully accessible entrance-exit for this station. Over the past year the MBTA has been negotiating with the owners of the 600 Washington Street Building to construct a station access (stairs, escalator and elevator) on the premisis.

The construction plans are now complete and negotiations for the land takings are in the process. The station access would occur in the entrance to the abandoned theater on Washington Street. There is the potential for further improvements on the northern portion of the platform in conjunction with private development (i.e. Lafayette Place II) on the block directly north of the project site.

Bus Service

The study area is also served by MBTA surface bus lines. Two bus routes are regularly scheduled to loop onto Harrison Avenue, Essex Street and Washington Street from Kneeland Street. The two routes are Bayview-Essex+Washington and Northampton-Essex+Washington. Bus Route 43, Egleston-Downtown, travels along Tremont Street, a convenient one block walk west of the site.

6. Existing Study Area Parking System

This study included a detailed review of the existing parking system in the study area. The analysis included on-street parking in close proximity of 600 Washington Street and off-street public parking in a somewhat larger area which was determined following discussions with the Boston Transportation

Department. The study area for the on-street parking analysis was presented, previously on Figure 3, while the off-street parking analysis included all public parking facilities within 1000 feet of 600 Washington Street and the major public parking garages within 1500 feet of the site. For organizational purposes, the first section of the parking analysis will discuss the parking supply inventories, followed by parking demand observations and finally parker characteristics.

Existing Parking Supply

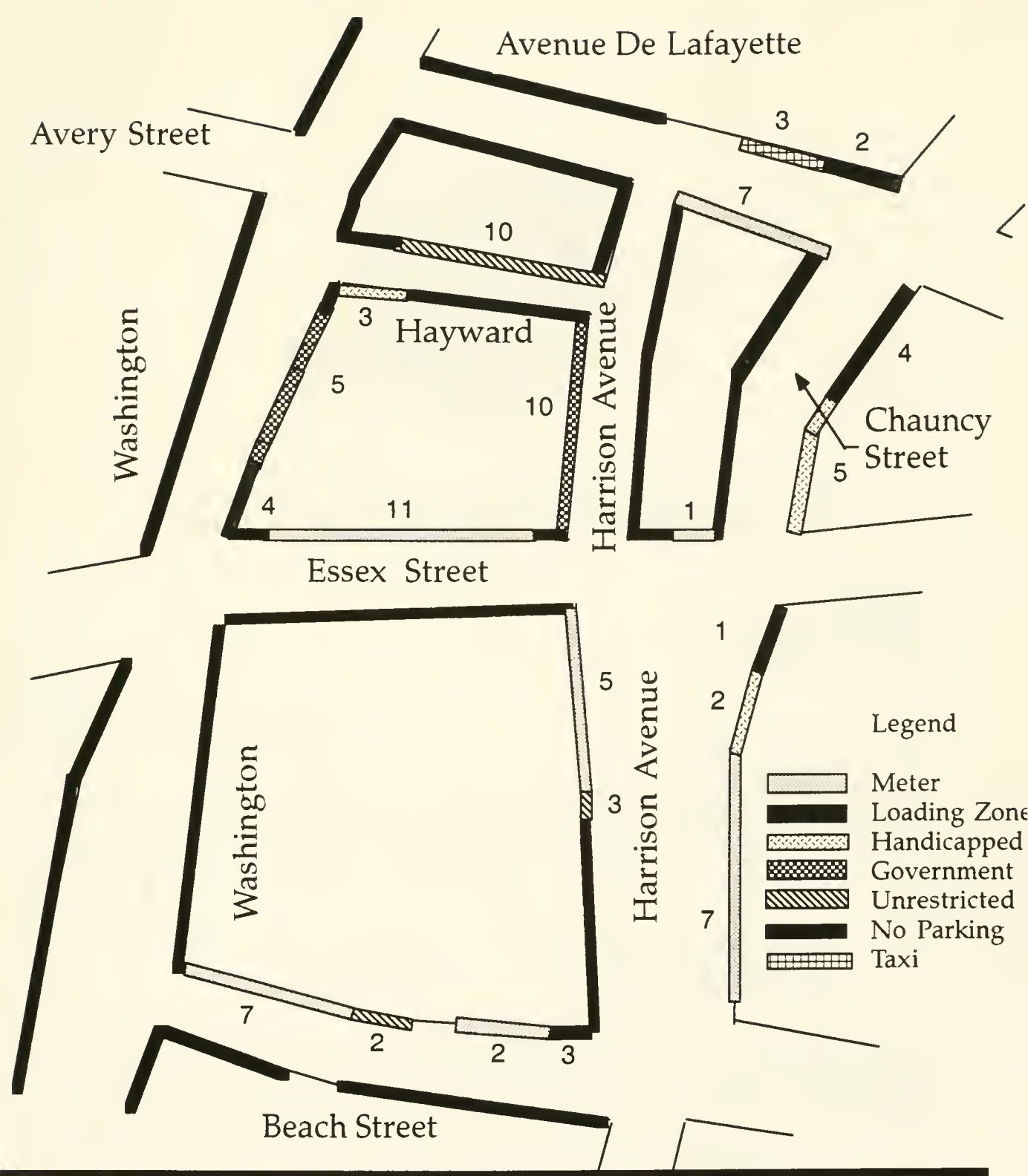
- **On-street Parking**

The on-street parking system within the study area has been categorized according to four major types:

- Meter
- Special
- Unrestricted
- Illegal

There are several types of parking that have been grouped by the "special" category including: (1) Loading Zones, (2) Handicapped, and (3) Spaces reserved for government vehicles. The illegal parking spaces include fire hydrants, driveways, and posted no parking areas. The unrestricted parking spaces do not have any posted parking restrictions to vehicles. Figure 11 summarizes how the above categories are allocated to the total curbspace within the immediate vicinity of the project. As can be seen, the majority of curbspace within the analysis area (65%) is designated as restricted space.

Figure 12 presents a summary of the on-street parking spaces. There are a total of 99 legal and special use spaces in the study area. Forty-two metered parking spaces are in the study area. There are also 42 spaces reserved for special uses. Fifteen spaces were found to be unrestricted in the study area. The majority of these spaces occur on the north side of Hayward Place.



On-Street Parking Supply

600 Washington Street Garage
Boston, Massachusetts

NORTH

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FIGURE 12

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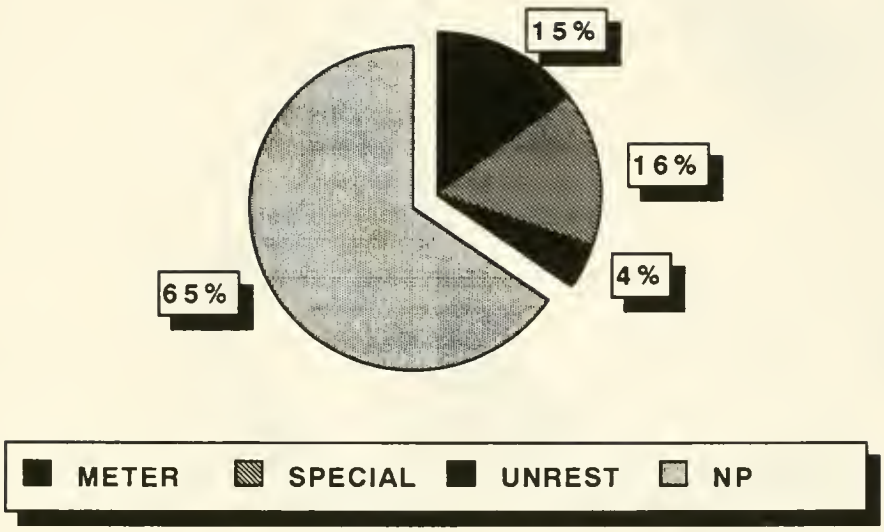

Figure 11
Summary of
Curbspace Allocation

- **Off-street Parking**

An off-street parking inventory, recently updated by the Boston Transportation Department (BTD) formed the basis of the overall parking analysis. The off-street spaces were categorized as follows:

- Private parking lot
- Public parking lot
- Private parking garage
- Public parking garage

This analysis focuses on the major public supply within a reasonable walking distance of 600 Washington Street. Figure 13 illustrates the location of the major public parking facilities within 1500 feet of the the project site. All of the off-street parking facilities were grouped according to distance from 600 Washington Street: those facilities within 500 feet; facilities within 1000 feet; and major public parking facilities between 1000-1500 feet were included in the analysis. The complete inventory of the off-street parking is presented in the appendix of this report.

Off-Street Parking Supply

600 Washington Street Garage
Boston, Massachusetts

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FIGURE 13

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In total, there are approximately 8462 public parking spaces located in the project area. Figure 14 illustrates the breakdown of the supply by type and location. From the graphic, it can be seen that only one percent of the supply in the area is convenient on-street space and only 37% off-street spaces are available within 1000 feet of the site. The majority of public parking supply identified in this analysis is in excess of 1000 feet.

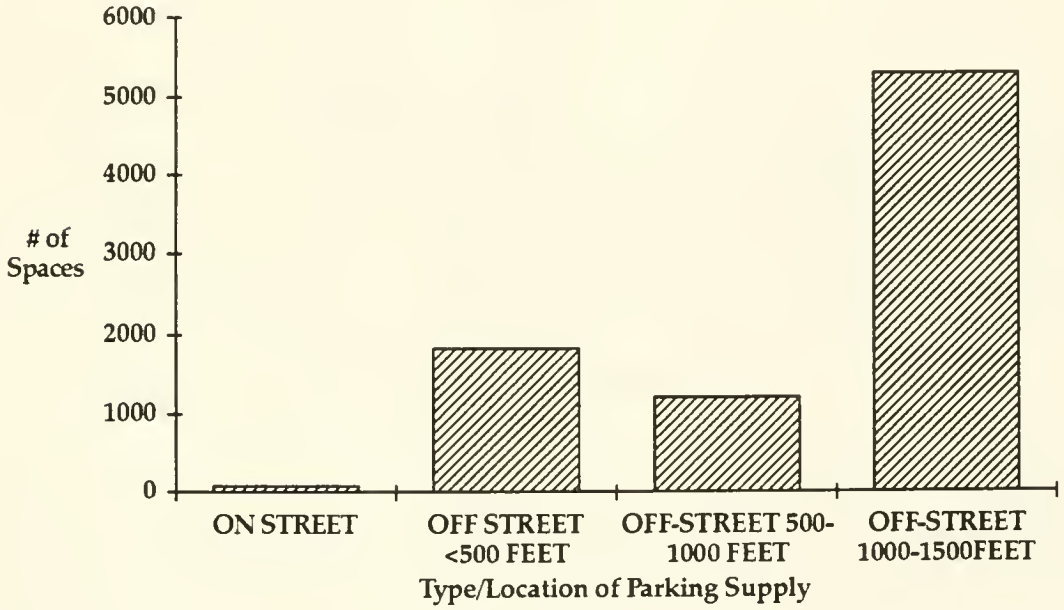


Figure 14
Summary of Parking Supply by Location

Beyond the 1000 foot radius from the site, major facilities which may be affected by this project were also identified. This included 5087 public (garage) spaces available within approximately 1500 feet.

- **Study Area Parking Rates**

In addition to determining the number and location of the public parking spaces, it is also important to review the parking rates for both on-street and off-street

supply. The parking rates are presented for one hour and eight hour intervals. Generally the one hour rate represents the short term parking rate, while the eight hour rate is generally considered the maximum daytime rate. For the entire area of influence, the average one hour parking rate is $4.01 and the average eight hour rate is $10.24. Table 2 presents a summary of the one hour and maximum off street parking rates in the study area.

TABLE 2
SUMMARY OF OFF-STREET PARKING RATES
IN STUDY AREA
(1988)

DISTANCE	AVERAGE PARKING RATES		RANGES	
			Low	High
Off-Street	One Hour	Eight Hour	One Hour	Eight Hour
0-500 feet	$4.04	$10.58	$3.75	$15.00
500-1000 feet	$4.21	$10.42	$3.00	$18.00
1000-1500 feet	$3.64	$ 9.68	$2.00	$14.00

Source: Boston Transportation Department

The rate structure currently being applied at the various parking facilities in the study area is geared to cover operating and debt costs and, as a result, tends to discourage all day parking. Rather, the short-term visitor, shopper or theater patron would tend to be using these facilities.

Existing Parking Demand Analysis

In studying parking demand in the area, separate discussions are first presented for both the on-street and off-street parking systems. The on-street demand estimates were compiled as part of this study by actual field observations. The off-street demand observations were conducted by the BTD in their recent study. The data was collected in two intervals, 10:00 AM and 12:00 Noon. These observations generally represent an update of data obtained in the 1982 Boston Parking Study.

- On-Street Parking Demand

During the two observation periods there were a total of 151 and 158 vehicles observed parked on-street within the study area as shown in Figure 15 compared to an on-street capacity of 99 spaces.

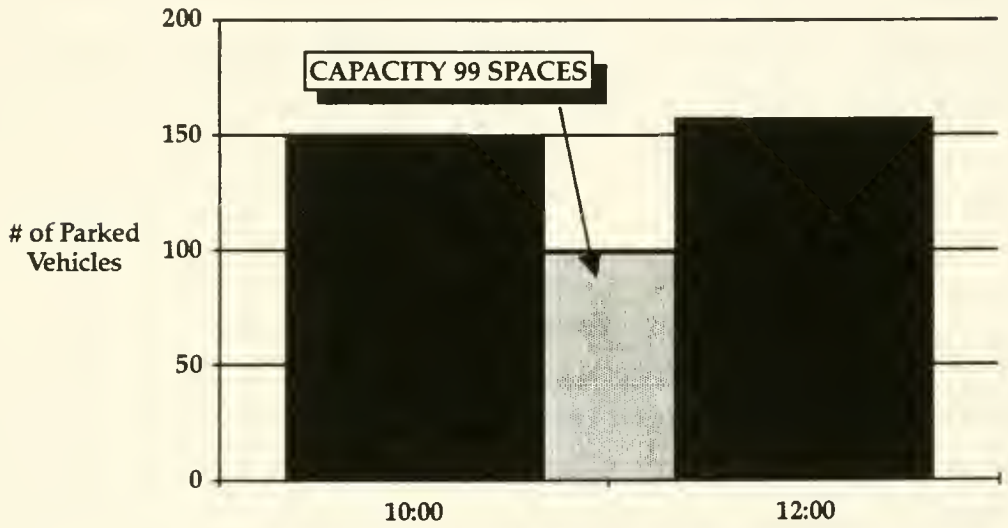


Figure 15
Summary of On-Street Parking Accumulation

As observed, there is extensive use of the on-street parking system in the study area; both legal and illegal spaces. The legal parking supply for the study area is 99 spaces including those spaces set aside for special uses such as loading zones (15), handicapped parking (10) and government vehicles (15). While the observed parkers are likely to be a mix of both long- and short-term parkers, these observations confirm the demand for convenient supply and the need for short-term parking in the study area. During the field observations there were many vehicles double parked on Harrison Avenue and Beach Street. Many of the special use spaces for handicapped and government spaces were noted to be occupied by other types of vehicles. Table 3 presents a summary of the on-street parking usage for each street in the primary study area.

TABLE 3
EXISTING ON-STREET DEMAND

No. of Legal Spaces	10:00 AM Demand	% Util.	12:00 PM Demand	% Util.
99	151	158%	158	160%

In addition to the vehicles seeking short-term parking, there also appears to be a shortage of spaces dedicated to commercial loading. The loading zones were observed to be in use by short-term parkers. This in turn forced many commercial vehicles to double park in order to serve their clients.

- **Off-Street Parking Demand**

The off-street parking demand was recently collected as part of the BTD update study. As with the on-street parking, the off-street parking demand is based on observations of each facility at 10:00 AM and 12:00 Noon. For the entire study area, the observed demand for the public parking facilities included in the analysis (8,367 spaces) varied between 74 percent and 81 percent of capacity at 10:00 AM and 12:00 Noon, respectively. Figure 16 shows the supply-demand relationships of public parking facilities by distance from the 600 Washington Street facility.

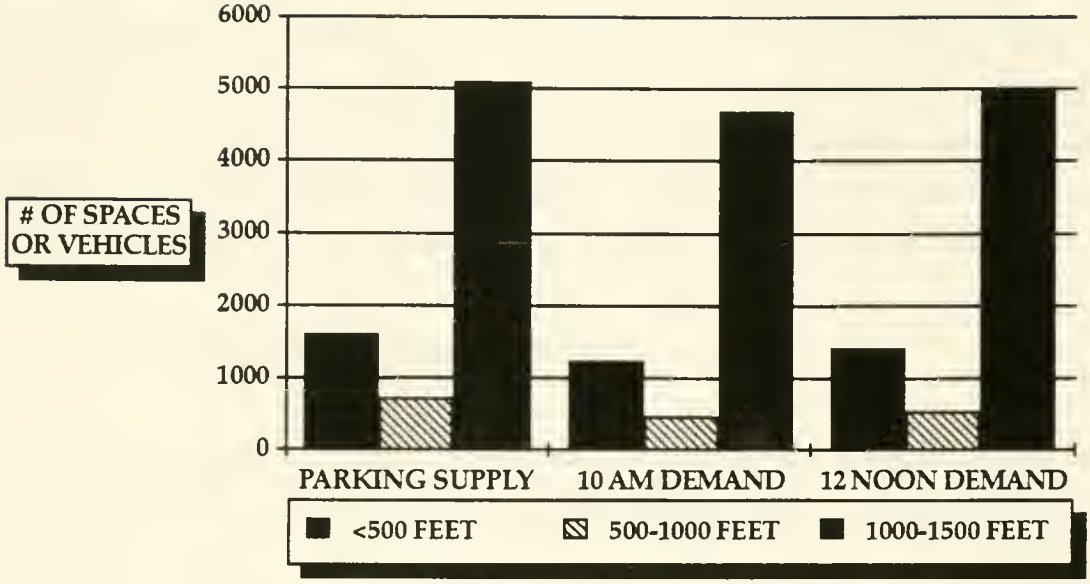


Figure 16
Summary of Off-Street Parking Demand

Parker Characteristics

In addition to providing an inventory of parking supply and analyzing parking demand in the study area, characteristics associated with an adjacent public parking lot and its parkers were identified.

- **Survey Location and Process**

In order to gain a better understanding of the off-street parking characteristics in the study area in order to forecast parking and traffic activity for the proposed new parking facility, detailed surveys were performed at the parking lot adjacent to 600 Washington Street. Based on discussions with the proponent and the parking facility manager, this lot has been assumed to generally represent potential operation characteristics of the proposed parking garage, although the garage will contain a greater capacity.

The surveys collected information on arrival and departure patterns, trip purpose, vehicle occupancy, and the general area of destinations. The surveys were conducted on Tuesday and Thursday between 8:00 AM-10:00: PM. The surveys provided data regarding parker characteristics that were used to forecast future parking characteristics of the 600 Washington Street parking facility. A summary of these findings is included below while the complete data profile from the surveys are presented in the Appendix of this study.

- **Current Operations of Observation Site**

The existing parking lot has 125 spaces and is served from a single access drive on Washington Street. There are no public monthly parking rates available to the general public. There are 15 customers that park free at this location including ten city employees, and one employee of 600 Washington Street management. On a typical day there may also be up to seven contractors working at 600 Washington Street on site that use the parking lot.

The parking rates for this lot are typical for the study area. The rate is $1.50 for every twenty minutes (an hour is $4.50) with the maximum rate of $12.00 which is reached after two hours and 20 minutes.

- **Arrival/Departure Patterns**

A profile of the vehicle accumulation (the number of vehicles parked at a given time) is presented in Figure 17.

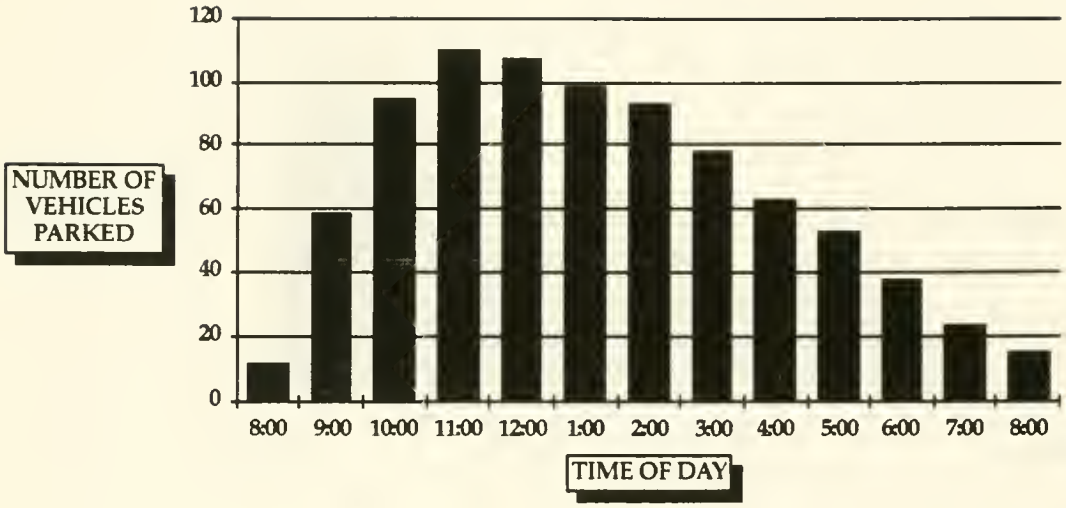


Figure 17
Observed Parking Accumulation
Washington Street Parking Lot

A total of 339 vehicles was observed to park at the lot in a 13 hour time period (8:00 AM-9:00 PM). At peak (11:00 AM -12:00 PM) there were 115 vehicles parked or 33.9% of the total vehicles parked over the course of the day. In total, the parking spaces turned over approximately 2.7 times during the thirteen hour period. Based on these data, the expected number of daily parkers in the proposed parking facility can be estimated assuming a similar vehicle turnover rate.

Also observed at this existing parking facility were the arrival and departure patterns. From this information, peak hour entering and exiting traffic can be estimated. Figures 18 and 19 illustrate the observed patterns with respect to the daily trips. The peak hour flows are developed with respect to the percentage of daily activity. These data are also summarized below in Table 4.

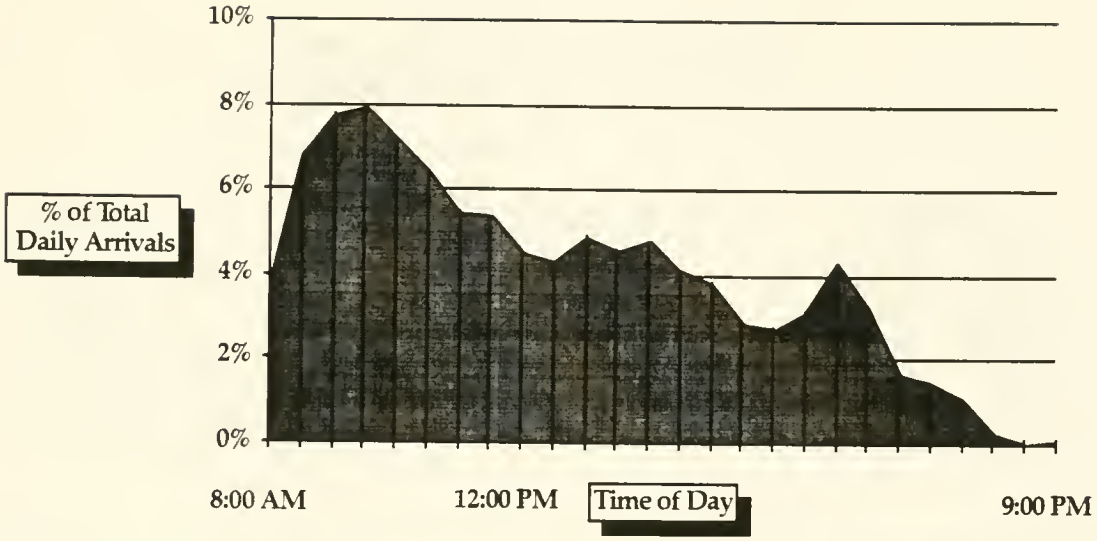


Figure 18
Observed Parker
Arrival Patterns

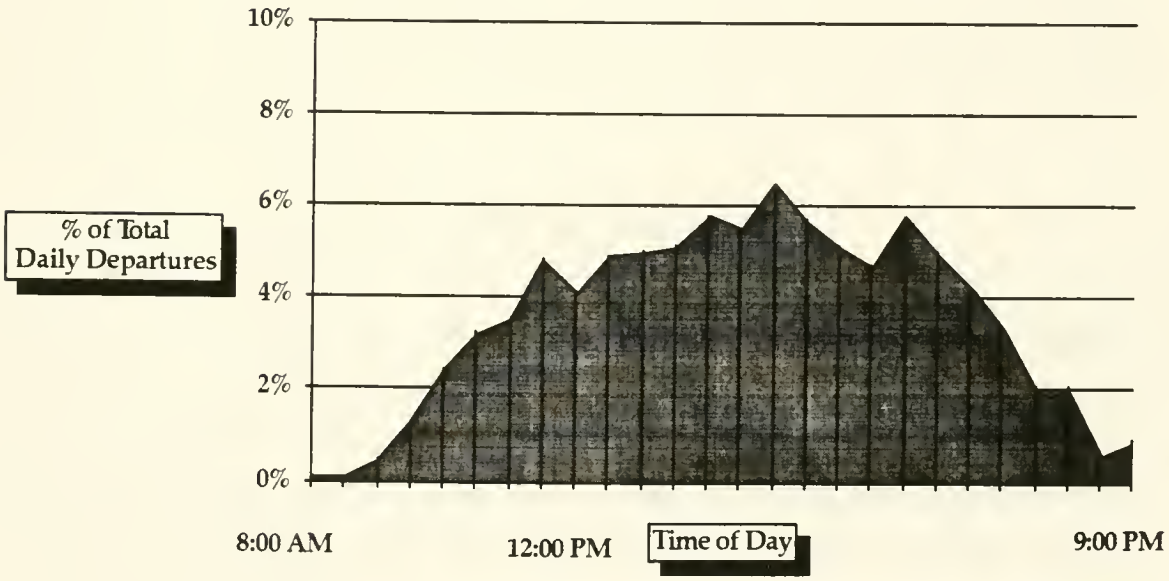


Figure 19
Observed Parker
Departure Patterns

TABLE 4
OBSERVED VEHICLE ACTIVITY
WASHINGTON STREET PARKING LOT
(entry/exit)

PERIOD	NUMBER OF VEHICLES			% OF TOTAL		
	IN	OUT	TOTAL	IN	OUT	TOTAL
All Day	339	339	678	100%	100%	100%
AM Peak Hour	33	2	35	9.7%	0.6%	5.2%
PM Peak Hour	22	37	59	6.5%	10.9%	8.7%
Peak Hour of Garage	37	41	78	10.9%	12.1%	11.5%

As shown in Table 4, the PM peak hour shows more activity than the AM peak hour. This reflects the current use of the facility by shoppers, business and personal trip purpose categories. These trip purposes generally occur later in the day. It can also be seen from the Figures that departure activity is spread throughout the afternoon and not concentrated within one or two hours. Finally, the peak hour of traffic activity at the parking lot does not coincide with the commuter peak hours. In this case, the peak hour of operation occurs between 1:30-2:30 PM.

- **Observed Average Vehicle Parking Durations**

Data was also collected for the parking duration of all vehicles. Figure 20 illustrates the parking duration observed for this parking facility. The average parking duration for the period observed was less than three hours,which reflects a greater demand for short term parking such as shopping, business and personal trips that this lot serves in addition to work trips. Sixty eight percent of all the parkers were parked for four hours or less. An average of only 14 percent of the total trips were observed to stay longer than seven hours.

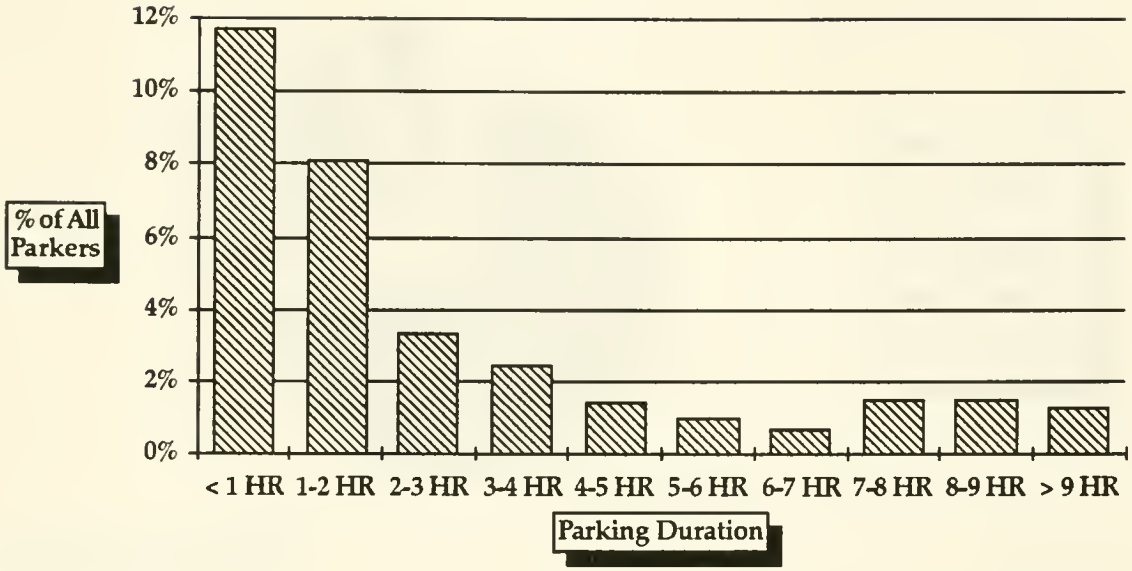
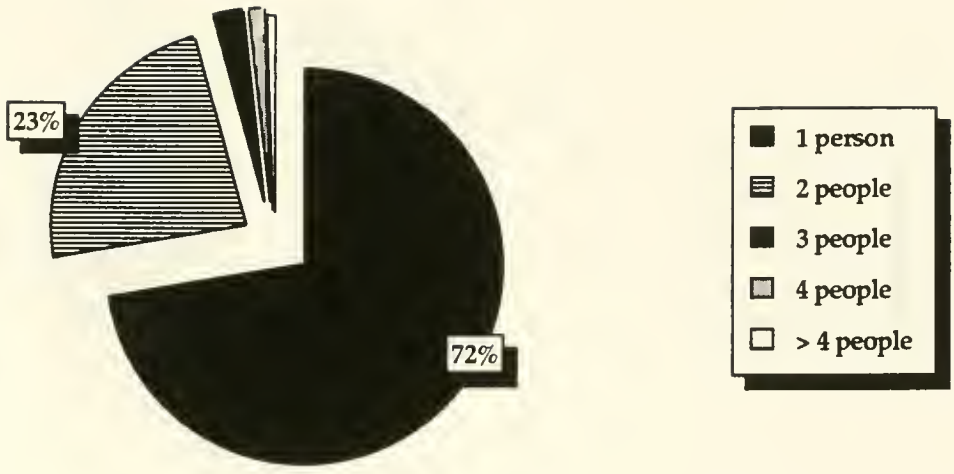


Figure 20
Observed Parking Duration

- **Observed Vehicle Occupancies**

During the normal business day (8:00 AM-5:00 PM), a majority of vehicles using the adjacent parking lot were single occupant vehicles, with over 72 percent of the vehicles for both survey days. Vehicles with one passenger comprised 23 percent of all vehicles while two passengers made up three percent of the total vehicles. The remaining two percent of the vehicles were observed to have four or more persons. The vehicle occupancy for the peak hour periods remained similar to the daily patterns, with a majority of vehicles having a single occupant. Figure 21 presents a summary of the observed vehicle occupancies from this survey. Based on these observations, the overall average vehicle occupancy is estimated to be 1.3 people per vehicle.



Note: Vehicles with 3, 4, or more people total remaining 5%

Figure 21
Observed Vehicle Occupancies
(percentage of all vehicles)

- **Observed Trip Purpose**

Part of the field survey was the collection of data on trip purposes of parking lot patrons. All patrons were asked and 250 responses were obtained. During normal business hours, there is a fairly balanced profile of trip purposes. As shown in Figure 22 the largest single trip purpose was shopping accounting for 37 percent of the trips. Patrons destined for work comprised 29 percent and 20 percent were destined for a business function. Twelve percent of the patrons responded they were on personal business, while two percent were in the other or not responding category.

- **Observed Trip Destination**

In addition to gathering data on occupants and trip purpose, the survey was structured to determine the general area of destination for the patrons. This information was useful in determining the area of influence of the proposed

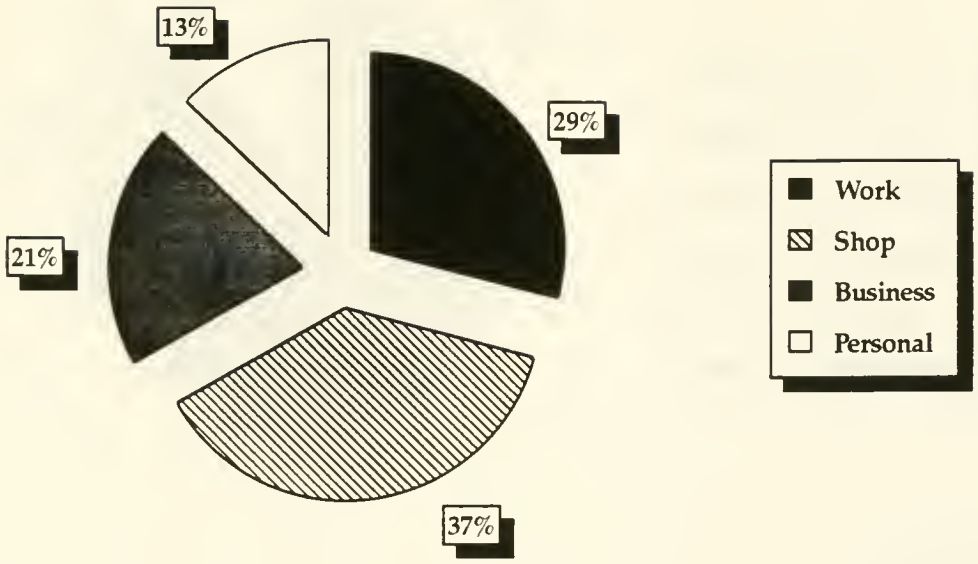


Figure 22
Summary of Observed
Trip Purpose

garage as well as gaining a better understanding of potential pedestrian patterns for the proposed parking garage.

The parking facility serves a number of surrounding destinations. For purposes of this study, the responses were categorized into recognizable areas. The single largest destination area was the downtown crossing area with 52% of the total parkers. Only 22 percent of the parkers were destined to the 600 Washington Building. The remainder of the trips were divided among Chauncy Street, Financial District, Chinatown and other or no responses. Figure 23 summarizes the destination data.

From the data, it is anticipated that the effective area served by the new facility will be within a 1200 foot radius of the garage. Also, pedestrian movement to and from the proposed garage may be more concentrated.

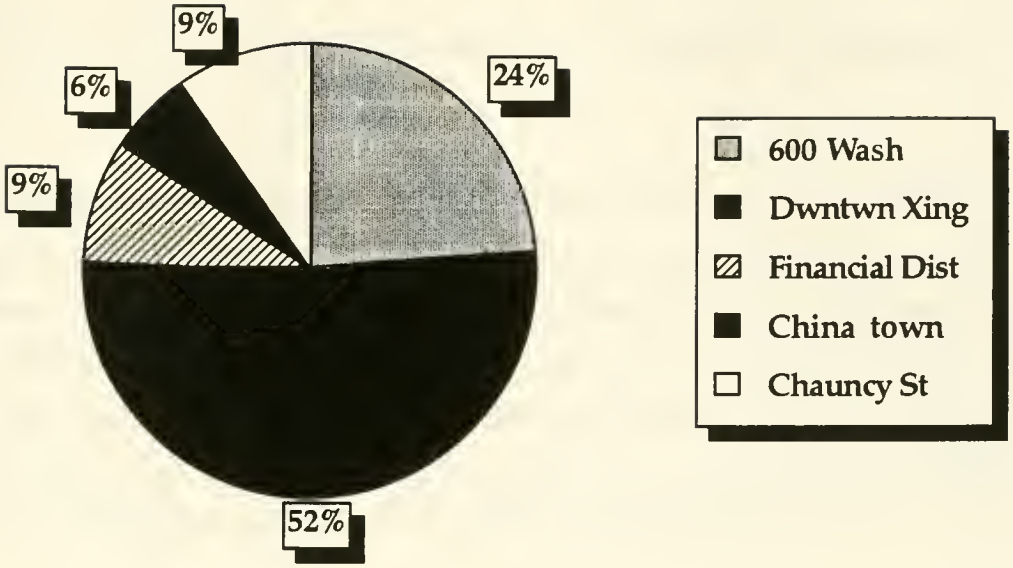


Figure 23
Summary of
Observed Destinations

C. FUTURE CONDITIONS ANALYSIS

This section of the study discusses anticipated conditions of the transportation system with and without the proposes 600 Washington project and details the impacts of same.

1. No-Build Traffic Networks

Changes to the transportation system must be considered in order to properly assess future traffic conditions. The expected transportation conditions can occur in two major ways, (1) additional traffic by general growth or (2) traffic generated by other identified major developments. This section presents estimates of future traffic for the design year of 1990 without the 600 Washington Street Garage (No-Build Condition). While a number of new developments (i.e. Commonwealth Center, Lafayette Place II) in or near the study area are in the construction or planning stage, their general effect on flows will be minimal or

insignificant given the timing of the project is well beyond the timing for this project.

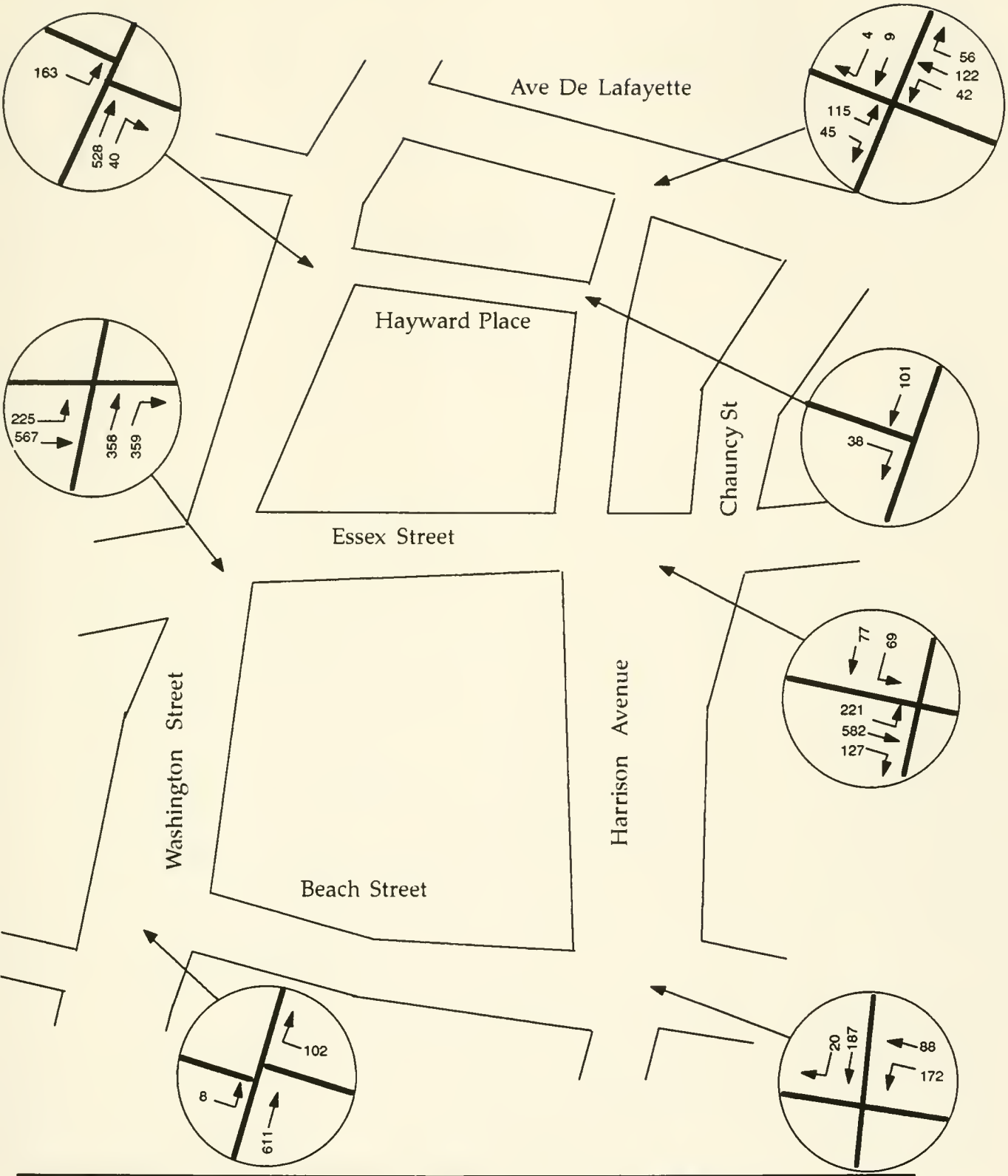
The Boston Redevelopment Authority is currently involved in two studies: (1) the Cultural District Study and (2) the Chinatown Study. Both of these studies have transportation components. The Cultural District Plan has projected traffic for 1994 based on expected land use patterns provided from the BRA. As of this writing, the Chinatown Study has not completed traffic forecasts. Under the Cultural District plan, the consultant used a one percent growth factor to project background traffic volumes under a No-Build scenario for that study.

Considering that the major developments, which will certainly effect study area roadways are years away, the No-Build traffic flows for this project were estimated by applying a growth factor to the existing traffic flows. The 600 Washington Street Garage would become the first development to be implemented in the immediate area and therefore it is reasonable to assume that a majority of future development will occur after 1990. Using these factors estimates of the 1990 No-Build traffic were developed and are summarized in Figures 24 and 25 for the AM and PM peak hours, respectively. The estimates and growth scenarios were coordinated with the BRA and their traffic consultant.

2. Site Related Traffic

Proposed Parking Management Plan

The parking facility would provide for 300 to 350 parking spaces on six levels. This estimate of traffic related to the facility and the analysis assumed the higher capacity figure to provide some level of conservatism. Access would be from Essex Street which is considered the prime access/egress point. A second access/egress drive is planned for Hayward Place which is located on the opposite side of the building from Essex Street.



1990 No-Build AM Peak Traffic

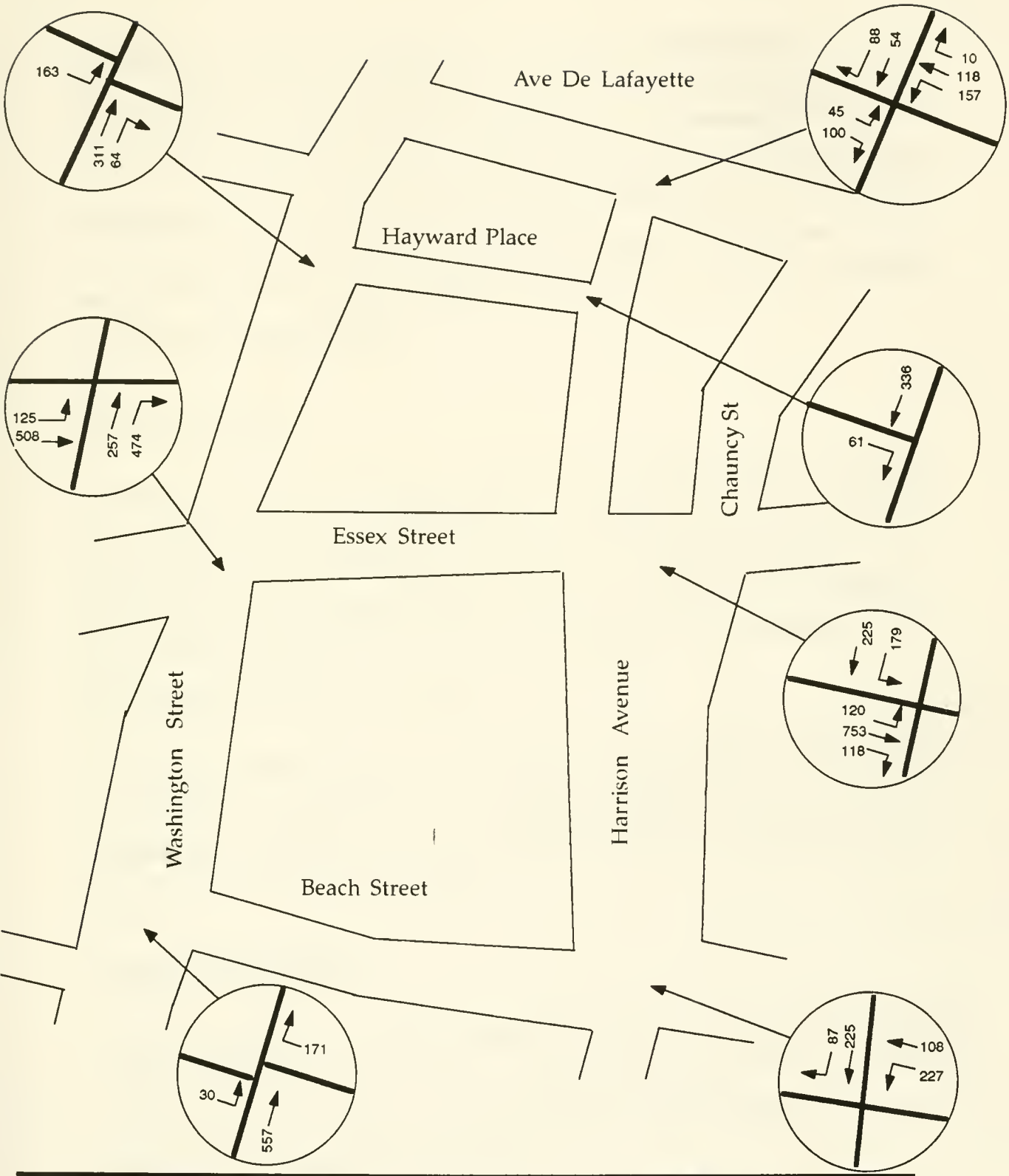
600 Washington Street Garage
Boston, Massachusetts

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

NORTH

NOT TO SCALE

FIGURE 24



1990 No-Build PM Peak Traffic

600 Washington Street Garage
Boston, Massachusetts

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

NORTH

NOT TO SCALE

FIGURE 25

The garage is planned to operate as a 100 percent attended facility. Upon entering the facility, parkers would leave their vehicle for the attendant to park. There would be no gate control at the street level. The attendants booth area would be located in the center of the parking level at the street level. Advantages to the use of this system include convenience to the parkers, provides for better security for the individuals using the facility, and during periods when vehicles enter the facility will not result in vehicle queues affecting the adjacent roadway system.

Number of Parkers

The most noticeable effect of this project will be the availability of additional parking spaces in the area. The initial step in determining traffic circulation or operational impacts is to estimate of the number of vehicles likely to use the new facility. Estimates of expected daily and peak hour trips were made based on the profile of data collected at the adjacent parking lot on Washington Street and discussed in the previous section.

Assuming a vehicle turnover of 2.7 vehicles per space which was obtained from researching data experienced by an adjacent parking facility, a total of 945 vehicles were estimated to use the 350 space facility on an average week day. This is assumed over a 13 hour period.

Entering/Exiting Activity

Table 5 summarizes the estimated trip activity related to the proposed parking facility at 600 Washington Street. The entering and exiting trips were determined as percentages of the daily parking activity which were based on observations at the adjacent parking lot.

The trip generation characteristics presented above assumes the new parking facility is expected to operate in a similar fashion to the existing adjacent surface

parking lot. As shown, the garage is expected to serve approximately 945 vehicles during the 13-hour observation period. During the morning peak hour 91 entering vehicles are expected while only 2 vehicles are estimated to exit. A total of 163 vehicles are estimated to either enter or exit the facility during the PM peak hour with the majority (102 vehicles) exiting.

TABLE 5
ESTIMATED VEHICLE ACTIVITY
PROPOSED 600 WASHINGTON STREET GARAGE

Period	Number of Vehicles	
	In	Out
Daily	945	945
AM Peak	91	2
PM Peak	61	102

Trip Distribution

In addition to determining the number of expected vehicles generated by the garage, the trip distribution (where the vehicles are traveling to or coming from) must be estimated. This forms a basis for assigning traffic to the local street system. The trip distribution patterns for the 600 Washington Garage are presented in Table 6. The patterns presented in this table are identical to patterns established in other major downtown studies[3]. The traffic assignment to the local street system was based on existing travel characteristics and most likely travel paths between the site and regional expressways such as the Massachusetts Turnpike, the Southeast Expressway and the Central Artery. The access between the site and these regional expressways are south of the site. Kneeland Street provides ramp connections to these facilities.

It is important to note that due to present circulation patterns on the surrounding roadway network, all vehicles must approach the site from either Boylston Street, to the west, or Washington Street, to the south. Vehicles

[3]Vanasse/Hangen Associates, Inc., Transportation Impact Study and Access Plan: 125 Summer Street Development, Boston, Massachusetts, July, 1986.

arriving from the north that continue to approach the site from Avenue De Lafayette are forced to travel southbound on Harrison Avenue, past Hayward Place for two blocks to Beach Street continuing to Washington Street and finally to the parking garage entrance on either Essex Street or Hayward Place. Other trips from Boston are expected to use Washington Street or Tremont Street to Boylston Street and Essex Street to reach the facility.

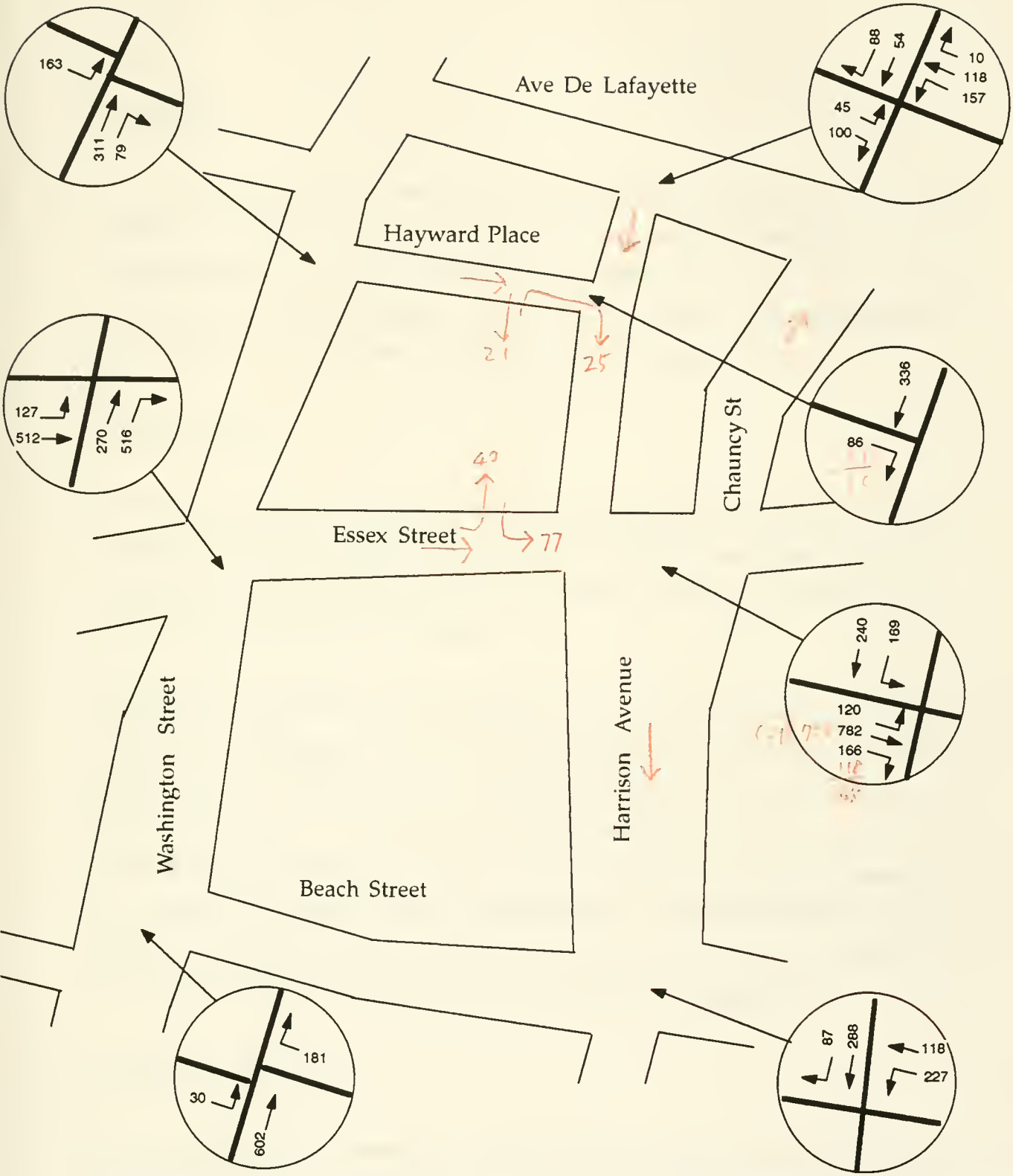
TABLE 6
SUMMARY OF ESTIMATED REGIONAL TRIP DISTRIBUTION PATTERNS

DIRECTION	PERCENT
Northeast	14%
North	14%
Northwest	9%
West	17%
Southwest	22%
Southeast	24%
Total	100%

3. Build Traffic Volumes

The expected traffic flows during the peak hours were assigned to the highway network according to the trip distribution patterns. This site related traffic was then combined with the estimates of the No-Build networks to form the future Build networks. The Build networks assume the 600 Washington Garage provides two access drives; one on Hayward Place and the second on Essex Street. The build networks for the AM and PM peak hours are presented in Figures 26 and 27, respectively.

The proposed parking garage will provide access on both Hayward Place and Essex Street. It has been assumed that 75% of all traffic to the garage will use the Essex Street access drive and the remaining 25% will use the Hayward Place drive. The Essex Street drive would be the first drive reached and it is being planned as the major drive.



1990 Build PM Peak Traffic

600 Washington Street Garage
Boston, Massachusetts

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

NORTH

NOT TO SCALE

FIGURE 27

4. Analysis

The previous sections of this report summarized existing traffic and parking patterns and expected trip generation and trip distribution/assignment for the proposed project. The next step in the study process is to determine the impact of the proposed parking facility. Included in the analysis is an examination of the traffic increases, the traffic operations and the parking system impacts.

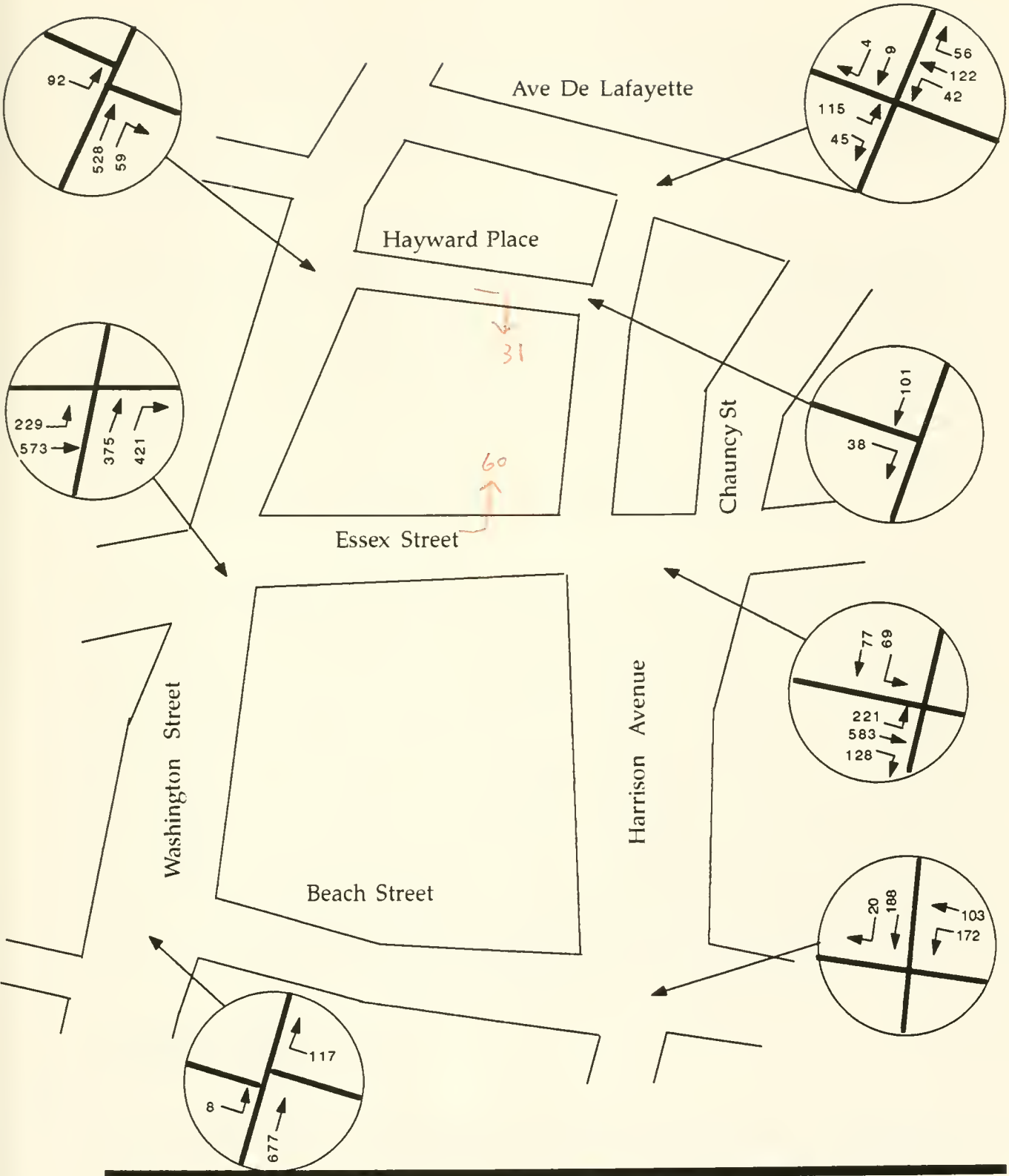
Traffic Increases

Due to existing roadway patterns, all traffic entering the 600 Washington Street Garage must travel through the Washington/Boylston/Essex Street intersection. Likewise all exiting traffic must travel through the Essex Street/Harrison Avenue/Chauncy Street intersection.

During the AM peak hour approximately 66 vehicles will use Washington Street to travel to the garage, 15 vehicles will use Beach Street and 10 vehicles will use Boylston Street. Exiting traffic during the PM peak hour will primarily use Harrison Avenue to the South (63 vehicles) and Essex Street to the east (39 vehicles; simultaneously during the PM peak hour traffic entering the garage will use similar arrival patterns as the AM peak period. The traffic increases entering the site during the PM peak hour will amount to 42 vehicles on Washington Street, six vehicles on Boylston Street and 10 vehicles on Beach Street.

Level of Service Analysis

The study area was examined with respect to capacity and delay characteristics to determine the Level of Service (LOS) provided under No-Build and Build networks. The LOS for each of these cases was then compared to existing conditions to determine the expected operation condition of traffic in the study area for 1990, with and without this project.



1990 Build AM Peak Traffic

600 Washington Street Garage
Boston, Massachusetts

NORTH

NOT TO SCALE

FIGURE 26

McDONOUGH AND SCULLY, INC. Consulting Engineers Framingham, MA

Table 7 presents a summary of the anticipated traffic operations at all intersections in the study area following completion of the 600 Washington Street Garage. The Existing and No-Build conditions are presented for comparative purposes.

Under the No-Build condition, the increased traffic related to background traffic growth will produce some changes in traffic operations during the peak hours. As shown in Table 7, the most dramatic effect will occur at the intersection of Washington at Essex and Boylston Streets. During the AM peak hour traffic is expected to reduce the LOS from "C" to "D" and during the PM peak hour traffic is expected to operate at LOS "E". The remainder of study area locations will not significantly change between the existing to No-Build condition.

The Build condition is not expected to produce any dramatic changes from the No-Build condition in traffic operations on the surrounding network. There will not be any new problem areas from a traffic flow perspective. The intersections of Essex Street at Harrison Avenue Extension and the Washington at Essex and Boylston Streets location will continue to experience congestion and vehicular delays. As shown on Table 7, the intersection of Washington at Essex and Boylston streets will operate at LOS "E" and the Essex at Harrison Avenue Extension intersection will operate at LOS "F" during the PM peak hour. This situation would occur even without the construction of the 600 Washington Street Garage. The Level of Service for all remaining locations will continue to be acceptable or operate at the same LOS as under the No-Build condition.

5. Pedestrian Flow Impacts

The construction of the 600 Washington Garage is not expected to dramatically alter the existing pedestrian patterns. As previously mentioned, the parking facility is not planned as a new major attraction, rather as a means for better serving the existing parking needs of the study area.

TABLE 7
SUMMARY OF TRAFFIC OPERATIONS

1. SIGNALIZED INTERSECTIONS		Existing Delay	Existing LOS	No-Build Delay	No-Build LOS	Build Delay	Build LOS
Washington/Beach	AM	11.1	B	11.2	B	11.7	B
	PM	12	B	12.5	B	14.2	B
Washington/Essex	AM	21.9	C	30.2	C	35.4	D
	PM	33.4	D	40.3	E	43.6	E
Washington/Hayward	AM	5.8	B	6.3	B	6.3	B
	PM	23.5	C	24	C	24	C

2. UNSIGNALIZED INTERSECTIONS		ARC	LOS	ARC	LOS	ARC	LOS
De Lafayette/Harrison	AM	570	A	574	A	570	A
	PM	674	A	647	A	647	A
Harrison/Hayward	AM	970	A	970	A	970	A
	PM	647	A	646	A	626	A
Harrison/Essex	AM	201	C	1509	D	150	D
	PM	0	F	0	F	0	F
Harrison/Beach	AM	431	A	405	A	393	B
	PM	306	B	260	C	208	C

Pedestrians and vehicles will use the two proposed access drives on Essex Street and Hayward Place. Presently, there are no plans for a direct connection from the garage into the adjoining office building. Therefore, all patrons including those destined for the 600 Washington Building will enter the garage with their vehicle and exit, walking from either of the two access drives. The pedestrian flow to the 600 Washington Building will not have to cross any street in the study area.

The expected destinations for the garage is expected to generally follow the existing patterns from the adjacent parking lot. Patrons destined for Chinatown are expected to leave on the Essex Street side of the garage, while the Hayward Place drive will generally serve Downtown Crossing, Lafayette Place, and Chauncy Street. Patrons destined for the 600 Washington Building could conveniently use either drive.

6. Evaluation of Parking

The construction of the 600 Washington Garage will add 300-350 parking spaces to the study area. This project is expected to be completed by early 1990. The parking spaces that will be available from this facility are primarily aimed at serving short term parking demand.

As noted previously, the existing on-street parking demand greatly exceeds its supply. This parking facility will offer an attractive, safe and convenient parking supply to accommodate this excess demand, thereby reducing the illegally or double parked vehicles, potentially increasing loading zone spaces, and eliminating the need for vehicles to circulate on the street network looking for on-street parking spaces.

The timing of this project is also likely to be beneficial to the parking supply as there are several nearby development projects that will reduce the off-street parking supply over the next several years while under construction. These

projects include the Lafayette Place II, and Commonwealth Center. Lafayette Place II will be constructed on the adjoining northerly block thereby eliminating the 125 space surface lot. Commonwealth Center will eliminate two existing All-Right parking lots on Washington Street and Avery Street.

7. Impact on City of Boston Parking Freeze

The proposed project is located within Boston proper as defined by the Boston Air Pollution Control Commission and since the parking spaces are to be commercial, their proposed project falls under the Parking Freeze regulations.[4] The Parking Freeze was established to achieve air quality standards in the City of Boston as part of the Transportation Control Plan. The parking "Freeze" in essence, limits the number of commercial parking spaces within the area (defined as Boston Proper) available to the general public.

Further, the regulations stipulate that before any commercial parking spaces can be constructed or modified within this area, the parking operator or owner must obtain a Parking Freeze Permit. The spaces can only be approved if an equivalent number of off-street or legal on-street spaces are removed or eliminated in order that the total number of commercial spaces remains at or near the imposed ceiling.

Discussions with Boston Air Pollution Control Commission staff indicates that there are currently between 400-800 parking spaces available within the "freeze".[5] Those spaces are expected to remain available until the public hearing which is tentatively scheduled for August of 1988.

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[4]City of Boston Air Pollution Control Commission, Procedures and Criteria for Issuance of Parking Freeze Permits, 1978.

[5]Phone Conversation with Denise Breiteneicher, BAPCC May 2, 1988.

8. Effect of Potential Essex Street Improvement Plan

The Boston Transportation Department is studying the Essex Street corridor. Included in the study is the potential for upgrading Essex Street between the Surface Artery and Avenue De Lafayette. As part of this improvement, Essex Street would be widened to accommodate bi-directional traffic flow. Avenue De Lafayette would then have one-way westbound to Harrison Avenue. Essex Street would remain one-way eastbound from Washington Street to Avenue De Lafayette.

The continued westbound traffic flow would be serviced by reversing the directional flows on Hayward Place and Avery Street. Avenue De Lafayette would be closed to traffic between Harrison Avenue and Washington Street. Washington Street would be closed to traffic at Avery Street. Both closed facilities would become pedestrian ways and included as part of the Downtown Crossing auto free zone.

Another potential feature of this improvement plan would include the relocation of Hayward Place, northerly to better align with Avery Place. The exact details on this part of the plan would depend on the development plans for the Lafayette Place II complex.

This potential improvement and the shift in traffic circulation is expected to alter the trip distribution patterns in the study area and for 600 Washington Street as well. Traffic traveling to the garage from the north via the Central Artery would be able to use the South Station exit and take advantage of the new westbound flow from the Surface Artery to Essex Street and Avenue De Lafayette to access the site. These improvements and circulation changes would effect approximately 28 percent of the site traffic.

Vehicles exiting from the proposed garage traveling toward the Massachusetts Turnpike to the west could be diverted to Hayward Place/Avery Street and

then to Tremont Street in traveling toward the Massachusetts Turnpike entrance. Other vehicles may choose to travel on Harrison Avenue to Kneeland Street and enter the Massachusetts Turnpike at the Surface Artery ramp.

The most noticeable impact to the proposed facility by these changes would be on the Hayward Place access-egress drive. Under the current situation this drive would act as secondary access as Essex Street would seem closer to most patrons.

In summary:

- The construction of the 600 Washington Street Garage will increase traffic on the surrounding roadway network.

- The traffic increases will range between 10 and 66 vehicles during the AM peak hour and six and 63 vehicles during the PM peak hour depending on exact location.

- The traffic growth associated with the No-Build condition will see the LOS deteriorate from LOS "D" to LOS "E" at the Washington/Essex/Boylston Street intersection during the PM peak hour.

- The intersections of Washington Street/Essex Street/Boylston Street and Essex Street/Harrison Avenue will drop from LOS "C" to LOS "D" during the AM peak hour under the No-Build condition.

- The Build condition will not result in any further deterioration of these key locations and the remainder of the study area locations are expected to operate at a satisfactory LOS during both peak hours.

D. CONSTRUCTION IMPACTS/MANAGEMENT

The next section of this study is concerned with the potential traffic impacts and

parking demands created by the construction phase of the 600 Washington Garage. The second element contained in this section formulates a management program to minimize these potential impacts.

1 Construction Impacts

Construction Employee Trip Generation and Parking

The number of workers required over the eight month construction period will vary, with an estimated average daily work force of approximately 20. Trip generation by construction workers is anticipated to be a direct function of employment levels. Assuming an auto occupancy of two or three persons (based on the shortage of parking, current costs of parking and the greater inclination of construction workers to carpool), the 20 employees during the peak construction period would generate approximately ten vehicle-trips each peak period if all employees use automobiles to travel to and from the project site. Some of the workers will likely utilize public transportation due to the downtown location and the Orange Line Station near the site. Construction workers tend to travel before the peak commuting hours (working 7:00 AM to 3:30 PM), thereby not affecting normal commuter peak hour traffic. As a result, the construction workers are not expected to have a significant impact to the roadway network in the study area.

There are no plans for on-site parking for construction workers. The adjacent lot and on-street locations may provide some parking for construction workers. Therefore, the construction workers traveling by private automobile will park in available public spaces in area lots or garages or at more remote locations and walk to the site. This situation is common for most downtown construction projects. There have been and will continue to be a large number of ongoing construction projects in the Downtown area. The high price of parking may also encourage lower auto use and higher transit usage or ridesharing.

Lane Restriction/Street Closures

It is anticipated that construction of the project will take approximately eight

months. As previously described, the construction of the 600 Washington Street Garage will occur within the shell of the existing building. During the construction period, the contractor will need to shore up the building and fence off approximately four feet of the sidewalks on the three sides of the building where construction activity will take place. The contractor will depend on curbside space for staging, parking and maneuvering of vehicles. The most logical location for this staging area would be on Harrison Avenue Extension. The use of the parking lane on that facility will provide a sufficient staging area for this project. The use of the parking lane is not expected to dramatically alter traffic flow on Harrison Avenue Extension. The elimination of the ten parking spaces, which are reserved for government vehicles, could be replaced by allowing those state cars access to the adjacent parking lot or by redesignating the ten unrestricted parking spaces on the north side of Hayward Place.

The contractor is not expected to impact on the use of either Hayward Place or Essex Street during the construction of the garage except while constructing the access curb openings. The parking on Essex Street will essentially remain in place as will the handicapped spaces on Hayward Place. The most significant impact will occur to the on-street parking system by the elimination of the 10 parking spaces on Harrison Avenue Extension.

Construction Vehicle Routings and Deliveries

The exact source locations of construction materials is not known at this time, but all deliveries will access the site via Washington Street. Deliveries from the north are expected to exit the Central Artery at the South Station off-ramp and then proceed to the site via Kneeland Street to Washington Street and Hayward Place. From the south and west deliveries will likely exit the southeast expressway or the Mass Pike off-ramps at Kneeland Street, then proceed to the site on Washington Street. Loading/unloading at the site would occur on Harrison Avenue. As planned, in all directions return trips will be via Essex Street to the Surface Artery and onto Central Artery, to the Southeast Expressway and the Massachusetts Turnpike.

The exact profile of daily construction trucks which will be generated by this

project is not yet known. The proposed construction technique will use significant quantities of concrete that is expected to be poured on-site and as a result, cement mixers will make up the majority of trucks in and out of the site. Therefore, the staging area must provide sufficient space to accommodate those trucks.

2 Construction Period Traffic Management

It is very important to develop a management program during construction of this garage. Since the construction will be primarily within the existing building shell, much of the activity will be shielded from passing traffic and pedestrians. Nevertheless, it is important to ensure that vehicles and pedestrians can pass safely through the area during this eight month construction period. The following presents the construction management program:

- The entire area under construction will be securely fenced. There will be a need to shore up the building during the construction period, and this area will be securely fenced off. The fenced area will also include a portion of Harrison Avenue to be used for the construction storage and staging area. Harrison Avenue is expected to remain open to traffic needs by the elimination of parking on the west side of this facility. The ten current parking spaces reserved for State vehicles could be relocated to the adjacent parking lot or to the north side of Hayward Place where there are ten unrestricted parking spaces.

- A pedestrian walkway along Harrison Avenue Extension, adjacent to the staging area, will be preserved during construction and appropriately protected by Jersey barriers. Overhead protection is not included as part of this plan as the work on the exterior of the building will be minimal. The construction is not expected to impact on the Washington Street side of the building.

- During the construction of the access drives to the garage on Essex Street

and Hayward Place and any sidewalk improvements, the existing sidewalks may require temporary closing. A relocated walkway, protected by a Jersey barrier or simply closing the sidewalk to through pedestrian trips are the available alternatives during this time period. The contractor will not impact on Essex Street by any other means except during this phase of the construction program. On Hayward Place the relocated sidewalk would occur adjacent to the existing sidewalk. During that period of construction, the ten relocated parking spaces for state vehicles on the north side might be closed to allow sufficient space for the flow of traffic and the sidewalk.

- Every effort will be made to encourage use of transit, ridesharing and remote parking will be employed throughout the construction process. The construction work will commence at 7:00 AM and end at 3:30 PM in order to promote off-peak travel by the 20 workers.

E. TRANSPORTATION ACCESS PLAN

1. Mitigation

While the anticipated traffic impacts of the proposed parking facility at 600 Washington Street is expected to be minimal and will, in fact, have potentially beneficial impacts on the surrounding street network, it is essential that a transportation access plan be developed which is designed to ensure that any negative effects are minimized, that positive impacts are realized and that the transportation goals outlined as part of this program are achieved. The following sections outline the proposed transportation access plan which includes a mitigation program of on-site and off-site actions and a proposed monitoring plan to gauge the success of the program. Under mitigation, the actions are categorized into traffic management and parking management elements.

2. Access Goals

It is important to understand that the construction of the 600 Washington Street garage is not aimed at encouraging new automobile trips into this area of the City. While the project may enhance the operations and viability of the office building, it is not intended to create additional transportation related problems in the Downtown area of the City. In fact, the garage can improve the area's roadway system by providing much needed short-term parking which should result in the reduction of the double parked or standing vehicles in no-parking areas. In addition, it should serve to eliminate unnecessary local circulation of vehicles in search of convenient space, and will allow for more efficient use of the roadway system. The "freeing up" of curbside space can also provide needed loading zones. This facility also provides opportunity for better supporting some of the wider goals of the Cultural District and the Chinatown community.

Working in the context of the benefits of the new parking facility, the transportation access plan must include some specific goals which are as follows:

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Working in the context of the benefits of the new parking facility, the transportation access plan must include some specific goals which are as follows:

- maximize the facility's use as a short term parking facility
- maintain or increase the use of public transportation by building tenants
- complement the goals/objectives of the Midtown Cultural District
- minimize the effect of the facility on air quality

3. Traffic Management

The traffic management program for this project is aimed at two sources: (1) the proposed parking garage and (2) the existing office building at 600 Washington Street. Strategies are designed to improve overall traffic flow and service in the study area while at the same time ensuring that the project does not result in a significant amount of new peak period traffic. For both of these areas, the traffic operations, improvements and strategies to control or reduce peak hour commuter traffic demand were developed and a description follows.

Intersection Improvements

As previously discussed, the construction of the 600 Washington Garage in itself will have very little impact on existing or projected (No-Build) traffic flows. There will be no change in the project levels of service between No-Build and Build conditions. However, there are two locations that are deficient in future scenarios without the project: Essex Street at Harrison Avenue and Essex Street at Washington Street. It should be noted that implementation of these traffic operation actions will tend to be the responsibility of the City.

- Essex Street-Boylston Street at Washington Street

Two specific improvements proposed for this location include better defining travel lanes and modifying the signal timing which will improve traffic flow in this area.

Essex Street should be striped to provide two through lanes of traffic, with the northernmost lane providing for a combination left-turn, through lane. Presently, it functions as a left turn only lane. This improvement should include the striping of Essex Street between Washington Street and Harrison Avenue for two lanes of travel. Washington Street can accommodate three lanes northbound and should have pavement markings that support this lane usage. The inside lane on the eastern side of Washington Street should be striped as an exclusive right turn lane.

The signal timing changes would provide additional "green time" to Washington Street. Due to the heavy right turn flows, there are some delays to this turning traffic. The configuration of this intersection with these improvements will allow for an expected LOS "C" operation with an average delay of 24.5 seconds during the PM peak hour for the Build condition.

This improvement concept has been discussed with the BRA's traffic consultant and the City's Transportation Department with regard to the impacts of the ongoing studies of the Cultural District and Chinatown.

- Essex Street at Harrison Avenue/Chauncy Street

The delays to Harrison Avenue traffic approaching Essex Street is the condition which is causing a deficiency at this location. One means for better serving the Harrison Avenue traffic and improving the operating condition as a whole is by enforcement of the "No Parking" regulations on the west side of that street. With no parking on the west side of the street, the 28 foot cross section can accommodate two lanes of traffic. Eliminating two parking spaces directly adjacent to the approach will also provide a smoother traffic flow. With two approach lanes at this location, the LOS for the Build AM and PM peak hours is "C" and "D", respectively.

Another improvement to this intersection would be the shifting of curb parking currently along the north side of Essex Street to the south side. This

improvement, while not providing specific added capacity, would allow better visibility of oncoming eastbound Essex Street traffic thereby maximizing the use of all acceptable gaps in the traffic stream. Presently, due to sight restrictions, acceptable gaps in the Essex Street traffic stream may not always be used as traffic maneuvers to obtain a better sight line.

Vehicular Traffic Control Strategies

These following strategies are designed to contain the amount of vehicular traffic generated by the 600 Washington Garage. *It is not the intention of the proponent or the City of Boston to have this proposed project result in greater peak hour automobile usage* . It is anticipated however, that, with additional short-term parking available and more extensive curbspace control, congestion levels and unnecessary circulation on study area streets will be reduced. While this particular project will serve only automobiles, the demand reduction component is focused on the adjoining office complex. Much can be done to reduce automobile usage and thereby lessen the need for improvements or allow for more efficient use of any improvements provided. The following measures are designed to control or reduce the number of vehicle trips into the office complex area during the peak commuting hours, particularly by tenants or employees in the building. The 600 Washington Associates Limited Partnership is committed to implementing these measures in so far as it is within their ability to do so.

- Promoting Alternative Transportation

The strategies discussed below revolve around encouraging tenants and their employees to use alternate means of transportation for commuting. Based on historical data on 600 Washington Street, approximately 70 to 80 percent of employees used transportation other than the private vehicle. This will continue to be encouraged by promoting alternative transportation through advertisements and the placement of transit schedules in the lobby of the building as well as periodic announcements sent from management to tenants.

• Ridesharing

Ridesharing is an overall term that refers to encouraging commuters to ride in vehicles with other commuters rather than driving to work alone. The most common forms of ridesharing are carpools and vanpools. Increased ridesharing decreases the number of vehicles using the roadways, and thus reduces the degree of congestion encountered by all motorists. Additional benefits are reduced fuel consumption and improved air quality, as fewer vehicle miles will be traveled.

The 600 Washington Associates Limited Partnership is committed to the following ridesharing incentives:

1. Provision of reserved parking spaces for vanpool vehicles including CARAVAN vehicles at a reduced rate.

2. Joint participation in carpool/vanpool matching services programs with other nearby tenants, organizations and companies when available.

3. Provision of promotional materials on ridesharing to building employees.

• Public Transportation

Another major way to reduce the number of vehicles on the roadways is to encourage employees to use public transportation as an alternative means of traveling to work. The proponent is currently working with the MBTA to develop a fully accessible station entrance/exit on the Orange Line (northbound service) on the premises. (See previous discussion) The Orange Line provides convenient transfers to the Red and Blue Lines, one and two stops away, respectively. The Green Line Boylston Street Station is within 1000 feet of the office complex. In addition, the proposed project site is located within walking distance (2,500 feet) of the South Station commuter trains, the Federal Street express bus stop, the Rowes Wharf commuter boat terminal, and all lines of the rapid transit system. This provides an excellent opportunity for the office

related commuter trips as well as a portion of short term visitors to maintain a high proportion of transit use. The 600 Washington Associates Limited Partnership will encourage transit usage through the following measures:

1. Provision of promotional and informational materials for all modes of public transportation.

2. Encouraging tenants to subsidize a portion of their employees' public transportation costs.

3. Provision of commuter bus, commuter rail and commuter boat schedules in the management office.

Pedestrian Related Improvements

An important component of the 600 Washington Street Garage is the pedestrian link to the neighborhood. As previously discussed, the garage will operate as an attended facility. As currently planned with the attendant parking system, the first level of the garage will act as the transfer area between the auto and pedestrian trips. A direct connection to the office portion of the building will not exist. As a result, pedestrians will have to exit the garage at street level onto either Essex Street or Hayward Place. With both vehicles and pedestrians using the garage entry/exit areas, care in design and operation will be necessary to minimize conflicts. This can be accomplished through signing, pavement markings, protected walkways and good lighting.

The pedestrian flows related to the garage are expected to follow existing patterns with a majority of pedestrian trips destined north of the site (i.e. Downtown Crossing, Chauncy Street and Lafayette Place). These trips would be expected to follow the sidewalks on Hayward Place to either Washington Street or Harrison Avenue. The pedestrian connection to the 600 Washington Building could occur on either Essex Street or Hayward Place and would depend on the vehicle access point. The trips destined to Chinatown are expected to use the Essex Street sidewalk to either Harrison Avenue, Washington Street or beyond.

600 Washington Associates Limited Partnership intends to define the pedestrian areas and enhance the linkage of these trips in the following manner:

Improve the appearance of all sidewalks surrounding the entire 600 Washington Street Building by repairing the sidewalk surfaces.

The sidewalk area at the facility access drives will provide a smooth transition, possibly with a change in texture to warn oncoming pedestrians of vehicle activity.

Improve the lighting along the sides of the building as a means to encourage parking activity for evening use such as theater trips. The lighting will improve the general appearance and create a feeling of safety in the project environs.

Clear, well-placed, yet unobtrusive signing for the garage will be provided for both potential parkers as well as providing a warning to oncoming pedestrians.

The Partnership will consider providing a direct connection from the parking area to the office portion of the building to reduce the amount of pedestrian activity which must occur at the vehicle access drives to the parking facility.

Parking Related Improvements

It is presently planned that the entire parking facility of up to 350 spaces and six levels be attendant parked, with the patron entering the garage and proceeding to a drop off area where an attendant will take the keys and park the vehicle. While this provides convenience and security, particularly related to the short term parker who is generally a visitor to the area, it also will provide some disadvantages. Potential problems created with the full attendant park system will depend on the level of long term parking which is allowed. If there is a significant amount of long term parking taking place, the likelihood of commuters arriving during the same time period is high. While a substantial

amount of room is provided for queued vehicles to wait to be parked, a chance will exist of a queue extending onto the street. This could be particularly critical as it pertains to Essex Street. Consequently, several parking related recommendations are suggested for consideration as part of the access plan. They are as follows:

The amount of long term parking should be limited to approximately 35 percent of the available spaces during the normal weekday.

Long term parkers should have to purchase a monthly permit and be required to park on the lower two levels. This parking would be self park with possible card control access system placed at the access point to the lower levels.

Associated with the above improvements, either stairways or possibly an elevator should be considered to bring parkers from the lower levels to street level.

A walkway from the street level of the parking facility should be provided to the building in order that anyone parking in the garage with a destination of 600 Washington Street does not have to exit to either Essex Street or Hayward Place. This would also serve to minimize potential pedestrian-vehicle conflicts right at the garage.

The facility should be priced at market rates which are designed to discourage long term parking and to free up parking spaces for the short term visitor. The initial rates would likely be in the range of $4.00 to $4.50 per hour with a maximum of $15 to $17.

Miscellaneous Improvements

The project proponent will provide on going support to achieve the Access Plan goals and objectives including the following measures:

Provision within the garage for a secure bicycle area which would be attended at all times, providing excellent security.

Provide on-site staff support both in the garage and at the office building to coordinate transportation mitigation measures through dissemination of information and appropriate materials.

Provide an information board at the garage transfer area displaying pertinent transportation brochures for alternative means of travel. A similar display will be placed in a conspicuous location in the main lobby of the office building as well.

F. MONITORING PROGRAM

The proponent will conduct an annual monitoring to program to ensure that the garage is operating in a manner that is consistent with the overall access goals of this project.

The following elements are included as part of the monitoring program for the 600 Washington Garage.

- The proponent will conduct a tenant survey to determine:

    -- Number of Employees
    -- Mode of Arrival
    -- Where Employees Parked
    -- Vehicle Occupancy
    -- Time of Arrival/Departures

The survey will determine the number of employees that currently drive to work and park their vehicles nearby. A previous survey conducted by the Boston Redevelopment Authority indicated that approximately 20 percent of the employees of 600 Washington Street used their automobile to travel to and from work. Ideally, that number would be lower today.

The purpose of this initial survey is to establish the landmark for future comparative surveys. The number of employees using the proposed garage should not exceed the current level.

The next component of the monitoring program would be a series of follow-up surveys.

- Once per year after the opening of the garage, the proponent will conduct a similar survey to determine that implementation of the garage has not resulted in an appreciable shift to auto trips by employees.

- The survey will be summarized in a report format detailing the results of the survey and clearly stating the conclusions.

- The annual report will also provide a profile of typical garage use over the past year. Included in this information will be:

    -- Turnover Statistics
    -- Average Parking Duration
    -- Average Number of Daily Parkers
    -- Average Number of Evening Parkers
    -- Use by Vanpool or Carpool

The proponent is committed to working with the City of Boston and any other agencies to address these or related transportation issues in the study area.

The effect on ambient air quality due to the construction of the parking garage at 600 Washington Street was studied in two areas--motor vehicle traffic at nearby roadway intersections, and emissions from the proposed parking garage. The analysis predicted 8-hour carbon monoxide (CO) concentrations at four sensitive receptors for two scenarios--1989 No-Build and 1989 Build.

1. Roadway Intersections

Ambient air quality in the vicinity of intersections is directly related to traffic operations and meteorological conditions. The Massachusetts Department of Environmental Quality Engineering (DEQE) maintains a permanent carbon monoxide monitoring station at the corner of Washington and Essex Streets directly across from the proposed parking garage. Therefore, the CO emitted by vehicular traffic and other background sources near the site is measured daily and reported annually by the DEQE. National Ambient Air Quality Standards (NAAQS) for carbon monoxide have been set by the U.S. EPA at 35 parts per million (ppm) for a 1-hour period and 9 ppm for an 8-hour period, each not to be exceeded more than once per year.

Second highest 1-hour (15.7 ppm)[6] and 8-hour (10.4 ppm)[1] CO levels for 1986 (latest year available) were used as the basis to compute the expected 1989 CO levels. The EPA MOBILE-3 emission model was run to estimate worst-case wintertime motor vehicle CO emissions for peak 1-hour and 8-hour conditions in 1986 and 1989. The established DEQE policy on modeling protocol was used. Emissions were calculated assuming a vehicle speed of 25 mph which is reasonable for the adjacent roadways. A composite exhaust CO emission factor for all vehicle types in 1989 was divided by the emission factor for 1986 and the result multiplied by the 1986 worst-case CO levels to get projected worst-case

[6]Massachusetts DEQE, Division of Air Quality Control, 1986 Air Quality Report, Boston, MA.

CO levels for 1989. Table 1 summarizes these calculations. It is expected that the second highest CO level due to traffic near the proposed garage in 1989 will be 11.6 ppm for the 1-hour case and 7.7 ppm for the 8-hour case. These decreases are primarily due to a larger portion of the vehicle population requiring full emissions control equipment and the stricter emissions limits of the Commonwealth's Inspection and Maintenance program.

TABLE 1
CALCULATION OF WORST-CASE 1989 CO LEVELS
(VEHICULAR TRAFFIC PLUS BACKGROUND)

	Measured CO 1986 (ppm)	Composite Emission Factor (g/mile)	1989 Composite Emission Factor (g/mile)	1986 Ratio of Emission Factors	Estimated CO 1989 (ppm)
1-Hour	15.7	43.79	59.06	0.741	11.6
8-Hour	10.4	27.73	37.24	0.745	7.7

2. Parking Garage

An air quality analysis was performed to estimate maximum carbon monoxide concentrations from the proposed parking garage under worst-case conditions at four sensitive receptors:

- Washington Street (pedestrian area)
- Essex Street (Pedestrian area)
- Harrison Avenue (pedestrian area)
- Hayward Place (pedestrian area)

CO from the garage will be collected by a forced-air ventilation system and released outside above ground level. The assumed location for the exhaust vent

is 30 feet above grade in the center of the portion of the Hayward Place block occupied by the parking garage. The Hayward Place receptor is located directly below the exhaust vent. The other three receptors are located in the middle of the block bounded by Hayward Place, Harrison Avenue, Essex Street, and Washington Street. All four receptors are assumed to be in the center of a six-foot wide sidewalk and six feet above the ground (pedestrian height). The results of this analysis show all maximum CO levels will fall safely within the compliance levels of the National Ambient Air Quality Standards (NAAQS). A discussion of the technical analysis follows.

The EPA MOBILE-3 emissions model was run to estimate worst case wintertime motor vehicle CO emission in 1989 for peak 1-hour and peak 8-hour conditions. The CO emission rate for light-duty vehicles traveling at 10 mph was found to be 14.12 grams/minute for the peak 1-hour and 8.39 grams/minute for the busiest 8-hour period. These are emission rates for a single vehicle.

The next step was to estimate the amount of time a car would be in the garage. Approximately 75% of the cars are expected to utilize the Essex Street access which puts them on the second level of the six-level garage. The other 25% of the cars are expected to use the Hayward Place entrance which puts them on the third level of the garage. This parking garage will operate as a "completely attended" facility which allows for multiple stacking of cars in the stalls. An entering vehicle is assumed to be delayed 10 seconds as the customer hands it over to the attendant. Each vehicle then travels an average distance of 795 feet to the center of the fourth-to-fifth level ramps at a speed of 10 mph (4.5 m/s) in 54 seconds. The time required to park the car is considered negligible due to the experience of the attendants working in the garage. The parking time is, in effect, part of the 54 seconds used to drive the average distance to the parking space. The total operating time for a vehicle entering the garage is therefore 64 seconds. For cars exiting the garage, we assumed the vehicle starts and unparks from a stacked stall space which is an average of two cars deep. The "outer" car is assumed to in-park in 10 seconds and the "inner" car in 30 seconds, resulting in an average of 20 seconds per un-parking maneuver. Each vehicle travels an

average distance of 795 feet to the Essex Street exit at a speed of 10 mph in 54 seconds. Ten seconds of delay time is assumed while the patron picks up the car. Thus, the total operating time for a vehicle leaving the garage is 84 seconds.

The traffic which will use the garage for the peak hour (1:30 - 2:30 pm) is estimated to consist of 102 cars entering the garage and 116 exiting the garage. The peak eight hours of operation are anticipated to be from 9 am to 5 pm with an average of 96 cars per hour entering and 86 cars per hour exiting the garage. The garage CO emission rates were calculated as:

Q_{in} (1-hour) = 14.12 g/min x 1.07 min/car x 102 cars/hour x 1/3600 hr/second

Qin (1-hour) =0.43g/sec

Q_{out} (1-hour) = 14.12 g/min x 1.40 min/car x 116 cars/hour x 1/3600 hr/second

= 0.64 g/s

Q (1-hour) = 0.43 g/s + 0.64 g/s = 1.07 g/s

Q_{in} (8-hour) = 8.39 g/min x 1.07 min/car x 96 cars/hour x 1/3600 hr/second

Qin (8-hour) =0.249 g/s

Q_{out} (8-hour) = 8.39 g/min x 1.40 min/car x 86 cars/hour x 1/3600 hr/second

Qout (8-hour) =0.289g/s

Q (8-hour) = 0.24 g/s + 0.28 g/s = 0.52 g/s

Since the proposed garage at 600 Washington Street is entirely enclosed, all six levels are ventilated with forced-air through an exhaust vent. This analysis assumes that the captured gases are exhausted thirty feet above street level on the Hayward Place side. Building code requirements for this type of structure mandate that 1.5 actual cubic feet per minute of air per square foot of floor space be ventilated through the garage. Estimates from the working floor plans indicate that there will be approximately 189,600 square feet of garage floor space. Therefore the required air flow through the garage complex will need to be 284,400 cubic feet per minute. The exit velocity of the duct was assumed to be 50 ft/sec (15.2 m/s), and the exhaust duct will require a total area of 94.8 square

feet. An emission rate of 1.07 g/s is expected for the peak 1-hour period while the peak 8-hour value is 0.52 g/s.

The predicted CO concentration in the garage for both the 1- and 8-hour analysis can be calculated in the following manner:

$$X_e = (870)\, Q/V_f$$

where: X_e = CO concentration in ppm

Q = emission rate in g/sec

V_f = volume flow rate through duct in m^3/sec

For the proposed garage, X_e is predicted to be 6.95 ppm for the 1-hour case and 3.38 ppm for the 8-hour case.

The impact of the forced-air-ventilation system on the air quality of the four sensitive receptors was calculated through the use of the Halitsky[7] model for wake cavity dilution. This approach assumes a typical building downwash circulation pattern for the air space between the exhaust vent and sensitive receptors. Halitsky developed an empirical equation for the dilution factor, D:

$$D = 2.22M \left\{ 3.16 + \frac{0.1(S)}{Ae^{0.5}} \right\}^2 \frac{V}{Ve}$$

which is used to scale the undiluted exhaust concentration (Xe) to a concentration at the receptor (X):

$$X = Xe/D$$

The turbulence factor M varies from 1.5 for exhaust and intake on the same roof, to 4.0 for exhaust on the roof and intake in the cavity near ground level. Since the exhaust vent is 30 feet above the sidewalk and each receptor is near ground

[7]Halitsky, James, "Gas Diffusion Near Buildings," Meteorology and Atomic Energy, pp. 221-255, NTIS TID-24190, 1968.

level an M equal to 4.0 will be assumed. S is the shortest arc distance from exhaust to intake in meters; Ae is the exhaust opening in square meters; V is the atmospheric wind speed and Ve is the exhaust air velocity. For a CO analysis, DEQE recommends worst-case (lowest) wind speeds of 1.0 m/s for both the 1- and 8-hour analyses.

Carbon monoxide levels from vehicular traffic were added to the exhaust vent concentrations at all receptors for the 1989 Build case and compared to the 1- and 8-hour National Ambient Air Quality Standards. These results, presented in Tables 2 and 3, predict the highest CO concentration will be 12.6 ppm for the peak 1-hour and 8.2 ppm for the peak 8-hour period. Most of these totals are the "vehicular traffic plus background" levels as the parking garage impacts are small.

Expected concentrations for the 1989 No-Build scenario are simply the value of the "vehicular traffic plus background" level at each receptor. The highest CO concentrations for the 1989 No-Build case then will be 11.6 ppm for the peak 1-hour and 7.7 ppm for the peak 8-hour period. The maximum 1- and 8-hour levels for each scenario are safely in compliance with the NAAQS. As a result, it is concluded that the operation of the proposed parking garage will not adversely affect air quality at any of the sensitive receptors.

TABLE 2
1989 BUILD 1-HOUR CO CONCENTRATIONS AT SENSITIVE RECEPTORS
(ppm)

Source Description	Washington Street	Essex Street	Harrison Avenue	Hayward Place
Exhaust Vent	0.27	0.22	0.49	0.01
Vehicular Traffic plus Background	11.6	11.6	11.6	11.6
Total	11.9	11.8	12.1	12.6
NAAQS	35.0	35.0	35.0	35.0

TABLE 3
1989 BUILD 8-HOUR CO CONCENTRATIONS AT SENSITIVE RECEPTORS
(ppm)

Source Description	Washington Street	Essex Street	Harrison Avenue	Hayward Place
Exhaust Vent	0.13	0.11	0.24	0.49
Vehicular Traffic plus Background	7.7	7.7	7.7	7.7
Total	7.8	7.8	7.9.	8.2
NAAQS	9.0	9.0	9.0	9.0

V.C. HISTORICAL LANDMARKS

The final element of the Environmental Assessment was to examine the project's impact with respect to the historic nature of not only the building, but also the surrounding historic district. This was accomplished by identifying the the ratings for the various buildings in the study area. The ratings have been determined by the Boston Landmarks Commission. Communication with the Commission as well as the Massachusetts Historical Commission was made during this analysis. A review of the anticipated construction program was made to determine what impacts and the nature of impacts the project may have.

A. LANDMARKS RATINGS

The Boston Landmarks Commission has developed criteria evaluating buildings and developed six categories (groupings) of buildings. Briefly the groupings are described below.

- *Category I. Highest Significance* --Buildings in this class are considered to have national historical and or architectural significance. The buildings classified as Group I are eligible for designation as a Boston Landmark or be in the National Register of Historic Places.

- *Category II. Major Significance* --Buildings in this category have the highest historical significance from the Boston, Commonwealth and the New England region. The buildings classified as Group II are also eligible for designation as a Boston Landmark or be in the National Register of Historic Places.

- *Category III. Significant* --Buildings in this group are considered significant to the local area (i.e. Boston). Buildings in this category are still eligible for designation as a Boston Landmark, but require further study. Following the further analysis it would need to be determined that the building exhibited importance to the Commonwealth of Massachusetts or the New England region

prior to designation. There are many buildings in the study area and in the City currently classified in this grouping.

• *Category IV. Notable* --Buildings in this classification are important places from a neighborhood perspective or particular street. Generally buildings in this category are not included as Boston Landmarks, nor individually listed in the National Register of Historic Places.

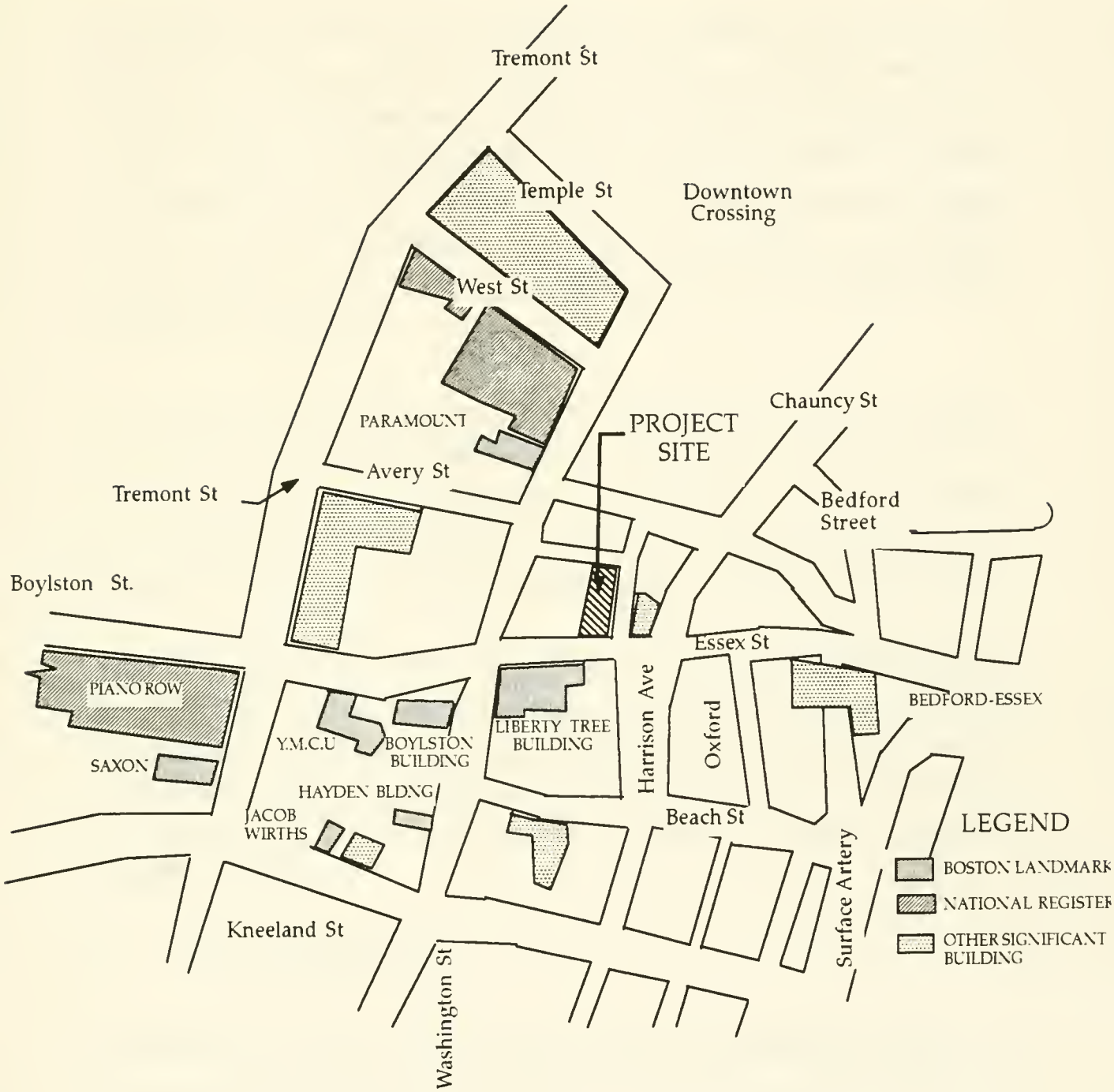
• *Category V. Minor* --This designation does not carry a particular historical or architectural importance, but rather, may make "a minor contribution to the streetscape".

• *Category VI. Non-contributing* -- Buildings in this grouping are considered incompatible with the surrounding historical area.

B. SITE LOCATION IN DISTRICT

The 600 Washington Garage, is to be constructed in the interior of the existing Washington-Essex Building. The present structure is categorized as a Class III ranking by the Boston Landmarks Commission (BLC). This implies some significance but, as of yet, the building has not been determined to hold any significant status for the Commonwealth or New England region. While the Washington-Essex Building is neither a National nor a Boston Landmark, it is within the Boston Theater District which is rich in cultural heritage and architecture. As such, there are a number of important historical resources in close proximity. Figure 28 presents an area map depicting the more significant buildings of historical significance. A listing of buildings in the theater district by BLC groupings is presented in the Appendix.

There are several historic buildings which are worth noting in close proximity to the project site.



Historical Landmarks

600 Washington Street Garage
Boston, Massachusetts

McDONOUGH AND SCULLY, INC Consulting Engineers Framingham, MA

NORTH

NOT TO SCALE

FIGURE 28

First, immediately south of the Washington-Essex Building is the Liberty Tree Block. This block was voted as a Boston Landmark on April 9, 1985 by the Boston Landmark Commission. Additionally, this block became listed on the National Register of Historical Places (NR) on December 9, 1980. The Liberty Tree Block includes the properties located on Washington Street and Essex Street. The Liberty Tree Block is also included in the Theater Area Multiple Resource Nomination. A listing of the Multiple Resource Nomination is presented in Appendix.

One block to the north and west of the site are the Paramount and Savoy Theaters. The Paramount Theater is a Boston Landmark (voted on February 14, 1980). The Savoy Theater (Opera House) was nominated as a landmark and a public hearing was held on October 25, 1983 and the matter has been continued. Both of these buildings are rated in Category II by the Landmarks Commission.

West and south of the Liberty Tree District are the Boylston and Hayden Buildings which are both Boston Landmarks and on the NR. Further to the west are several important historical resources, including Piano Row, Jacob Wirth's, the Wilbur Theater, Charles Playhouse and Music Hall. East of the study area are the Proctor Building and the Essex-Kingston District. The latter is potentially eligible for the NR.

C. IMPACT ASSESSMENT

The construction of the proposed parking facility at 600 Washington Street is to be accomplished from within the existing shell. In that regard, the exterior of the structure is not expected to be significantly altered. There will be access-egress openings at the street level on both Essex Street and Hayward Place. The remainder of the structure will not be altered during the construction phase or operation of the parking facility. In that regard, the construction of this project will not have an appreciable effect on any Boston Landmark or National Register property.

VI. PUBLIC BENEFITS

The proposed 600 Washington Garage is undoubtedly geared to enhancing the long term viability of the building by providing parking spaces. There are also aspects that offer benefits on the broader scale. Recognizing that the project is in the designated Midtown Cultural District, the project proponent is proposing to provide several public amenities to encourage the BRA's plan for the area. Included in the short term in conjunction with the parking garage are :

- ticket booth/information kiosk
- advertisement window cases
- late garage openings for special events nights
- possible shuttle service for theater patrons using the parking facility

In the long term, the proponent is considering including a small gallery/showcase area for the arts. Depending upon the City's decision with regard to Avenue De Lafayette and Hayward Place, the gallery may be able to be provided in conjunction with public open space along Hayward Place.

The project as proposed includes constructing a parking facility within the existing building structure of 600 Washington Street. There is no associated new construction of additional office or retail floor space. It is understood that the use is a conditional use requiring a Conditional Use Permit from the BRA. All the permits currently anticipated for this project are listed below:

- Conditional Use Permit from the BRA
- Parking Freeze Permit form the Air Pollution Control Commission
- Building Permit from the Inspectional Services Department

For informational purposes, site calculations are as follows:

	Existing	Proposed
Height	130'0"	130'0"
Number of Stories	7	7
Square footage of lot	48,998	48,998
Rear Yard	0	0
Parapet Setback each Side	None	None
Parking Facilities	0	300-350
Building Gross Size (sf)	402,400	402,400
Building Usable Size (sf)	270,000	380,000
Floor Area Ratio	8.4	8.62

The project will be taking place entirely within one block in Downtown which is controlled by the project proponent. As such, there are no direct abutters nor displacees as a result of the project.

Regarding any groups which may be somewhat interested in the project, it would be anticipated that the Chinatown community may be interested in the project as it is in close proximity of the neighborhood. The Downtown Crossing Association or theater groups may also have an interest as the project may provide additional visitor or patron parking which has security.

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